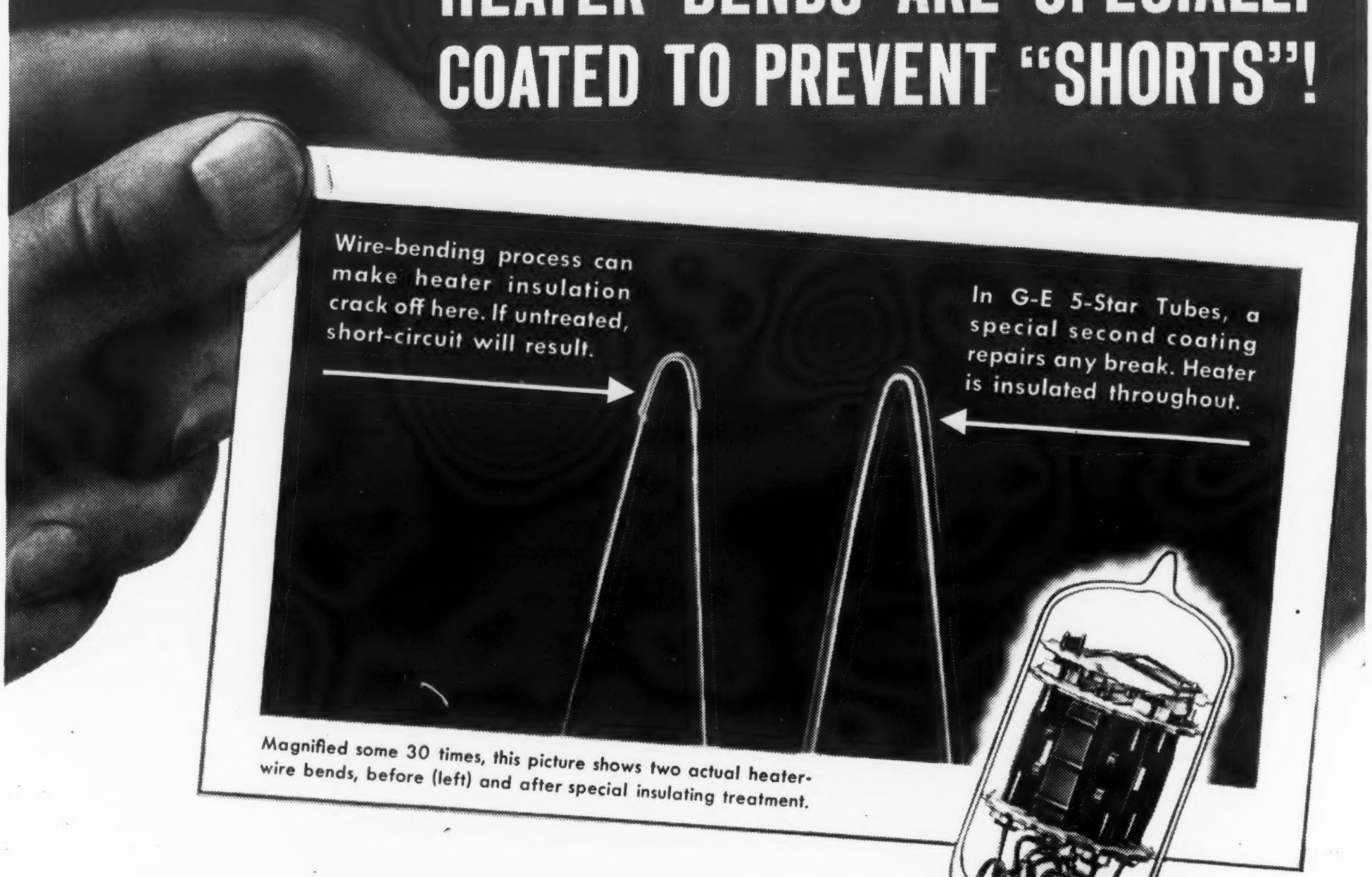
March-April 1954

Communications—Electronics—Photography

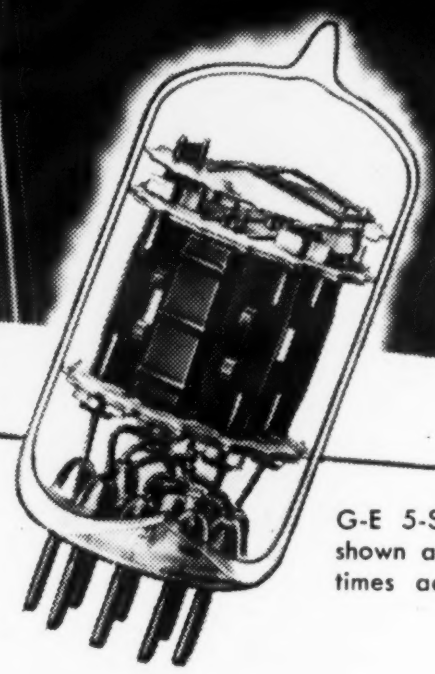
SIGNAL

In G-E 5-Star Tubes—

HEATER BENDS ARE SPECIALLY COATED TO PREVENT "SHORTS"!


Wire-bending process can make heater insulation crack off here. If untreated, short-circuit will result.
In G-E 5-Star Tubes, a special second coating repairs any break. Heater is insulated throughout.

Magnified some 30 times, this picture shows two actual heater-wire bends, before (left) and after special insulating treatment.



G-E 5-Star Tube, shown approx 1½ times actual size.

HEATER-CATHODE short-circuits are a common cause of tube failures. In G-E 5-Star Tubes, heaters won't "short"! The bends in 5-Star heater wire are specially coated *a second time* with the help of an electrical charge that deposits material wherever the coating may have cracked or flaked off. Result: 100% insulation!

Heavy wire, substantially and evenly coated . . . a heater bar that is welded to the base lead, also firmly staked to the bottom mica spacer . . . these special heater features are typical of 5-Star high-reliability design. Add tube parts, including heaters, that are individually inspected and micro-measured! Add painstaking assembly and rigid tests that include a 46-hour factory "burn-in" to weed out the few early life failures!

Electronic apparatus—communications, radar, gun-control, or other type—will prove far more trustworthy when the original tube complement is 5-Star. And you can install 5-Star tubes in your present equipment! Write . . . today . . . for interchange list! *Tube Department, General Electric Company, Schenectady 5, N. Y.*

General Electric 5-Star Tubes are the most reliable you can install! Among their many design features are:

Double mica spacers at both top and bottom brace the internal structure, and enlarge the surfaces in contact with the glass envelope. Result: greater resistance to shocks and vibration.

★

In order to give 5-Star Tubes increased strength, (1) the cage is shorter, sturdier, (2) cathode is larger in diameter, (3) stops on the vertical support tabs are welded in place.

★

Getter is double-staked in order to withstand shocks and vibration.

★

A getter flash shield helps keep conductive deposits off the mica spacers, in tubes where plate-grid leakage must be held to a minimum. Special slots in the spacers further decrease leakage.

★

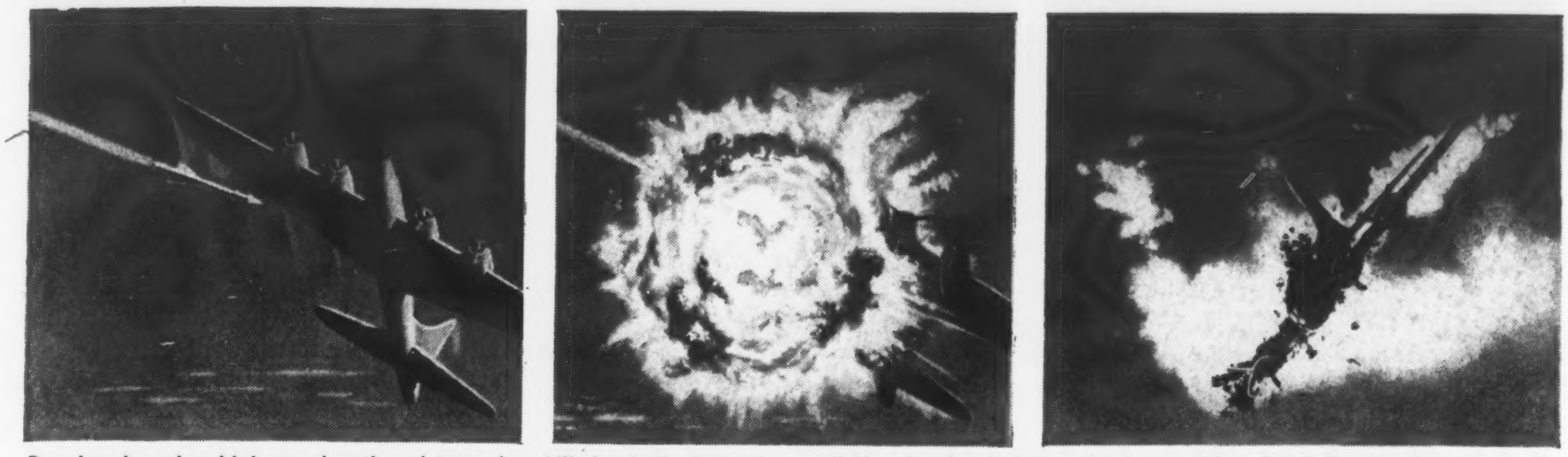
The grids are gold or silver-plated to prevent grid emission.

★

Grid legs are smooth (not nicked) in order to assure a continuing tight fit where the legs pass through the mica spacers. This cuts down on grid vibration and microphonic noise.

GENERAL ELECTRIC

164-1A2



Drawings based on high speed motion pictures show Nike's missile destroying a pilotless bomber in test at the Army's White Sands Proving Ground, N. M.

Winged Victory... product of telephone wizardry

This is the story of NIKE (ny'key)—named after the Winged Goddess of Victory of ancient Greek mythology.

But today's Nike is no myth! It's one of Uncle Sam's most fantastic new defense weapons—proved in tests and now being delivered to the Army by Western Electric, maker of your Bell telephone.

Nike is the first system in production for keeping anti-aircraft guided missiles under constant automatic control from the ground, enabling them to track down and destroy any existing type of plane, regardless of its speed, no matter how high it flies, what evasive action it takes.

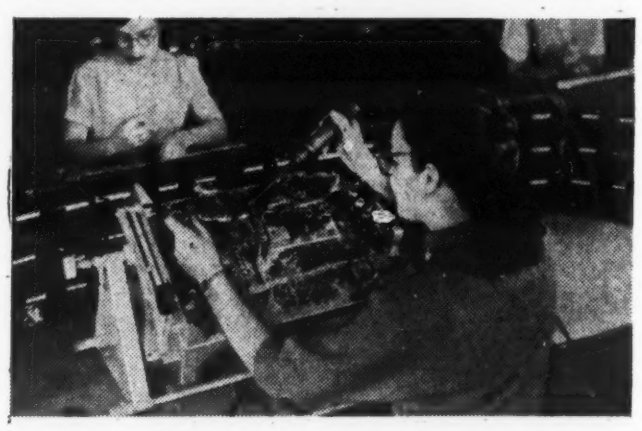
You'd find Nike's brain filling several large vans with complex electronic equipment. Signaled by an air warning net that hostile planes are approaching, Nike picks up the target and tracks it electronically. With incredible speed and accuracy, Nike pinpoints a plane's position—tracks it relentlessly—tells when to launch the missile—follows the missile's flight—and guides it to the target at supersonic speed. Then . . . *the kill!*

Inside central control van, these soldiers watch radarscopes as Nike automatically guides a missile to its target.

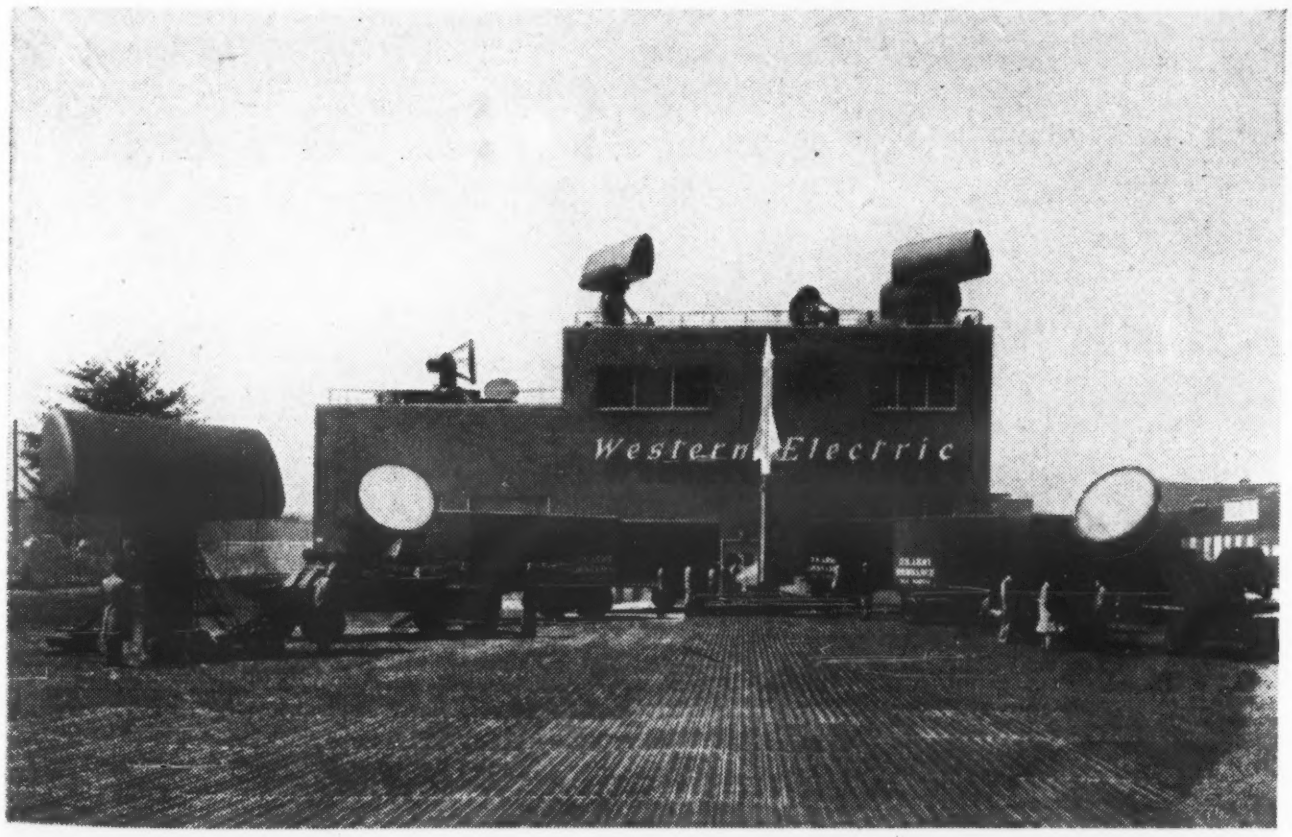
Such a weapon may seem wholly unrelated to your familiar friend the telephone—which doesn't look complex. But the telephone you hold in your hand is connected with a maze of intricate mechanisms in which electronics plays a mighty part.

Special skills and techniques developed jointly by Western Electric, manufacturing unit of the Bell System, and Bell Telephone Laboratories, our teammate in creating the nation-wide telephone network, were just what were needed to transform Nike from an idea to a combat-ready reality.

Working closely with Bell Laboratories, the Army, Douglas Aircraft (which is responsible for the missile itself), and with hundreds of sub-contractors, Western Electric has applied its unique ability in electronic technology to producing a mighty weapon of defense. In this achievement, Western Electric—



A Western Electric girl assembles one of the more than 300 "brain cells" that guide a Nike battery's missiles.



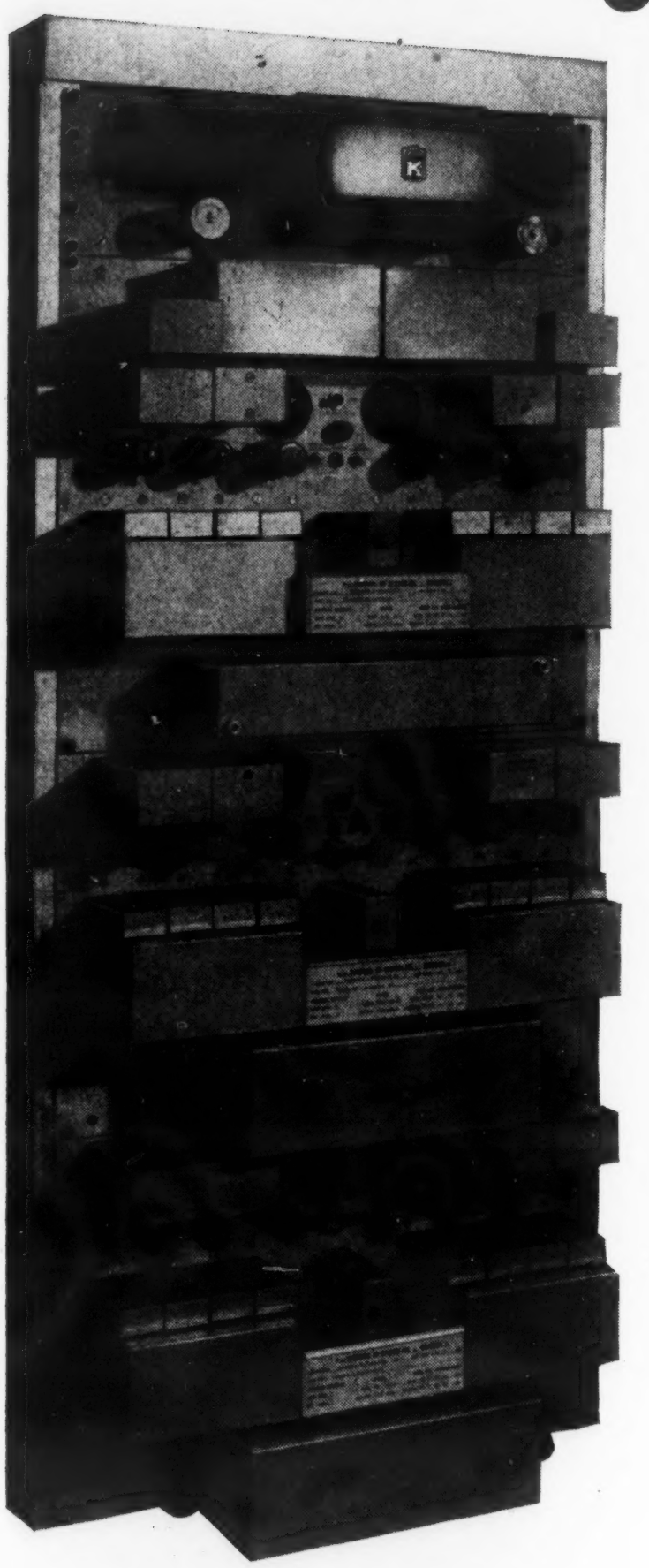
Principal units of Nike anti-aircraft guided missile system are shown here grouped in front of Western Electric test building.

like all the Bell telephone companies—is continuing to carry out the Bell System's guiding principle: "*Service to the Nation in Peace and War.*"

Western Electric

A UNIT OF THE BELL SYSTEM SINCE 1882

KELLOGG Carrier SERVES and SAVES



Kellogg's Standard of Quality Assures These Savings!

- **QUICK, PERMANENT INSTALLATION**

  Kellogg Three-Channel Transmitted Carrier Terminal is quickly installed in a few hours time — it takes less than a day to place the system in complete operation.

- **MINIMUM ADJUSTMENT**

  No carrier leak adjustment, no synchronization adjustments required — no chance for misalignment or voice frequency shifts — longer tube life.

- **SIMPLIFIED MAINTENANCE**

  Straight forward circuits — simplified testing. A jack field is provided in each carrier unit for monitoring or for quickly checking carrier levels with standard test instruments.

TRIPLES TALKING CAPACITY ON EXISTING TELEPHONE LINES!

Quickly — without costly delay — Kellogg Carrier is ready to serve, ready to save for you. The same day it is delivered, a Kellogg Transmitted Carrier System provides you with up to *three* new signalling and talking circuits over each existing line. And you get this fast step-up in service without spending money on time-wasting adjustments — without adding a single cross-arm or wire! Kellogg's traditionally high quality standards assure continuous, trouble-free performance. Every installation proves it — Kellogg Carrier saves and serves best!

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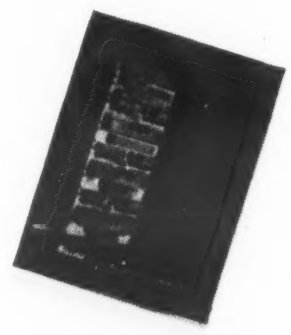
Your free copy of "Kellogg No. 5 Transmitted Telephone Carrier Systems" will give you comprehensive data on service and savings. It contains all information you need on carrier systems. Address Dept. 5-C.



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SIGNAL

Communications-Electronics-Photography

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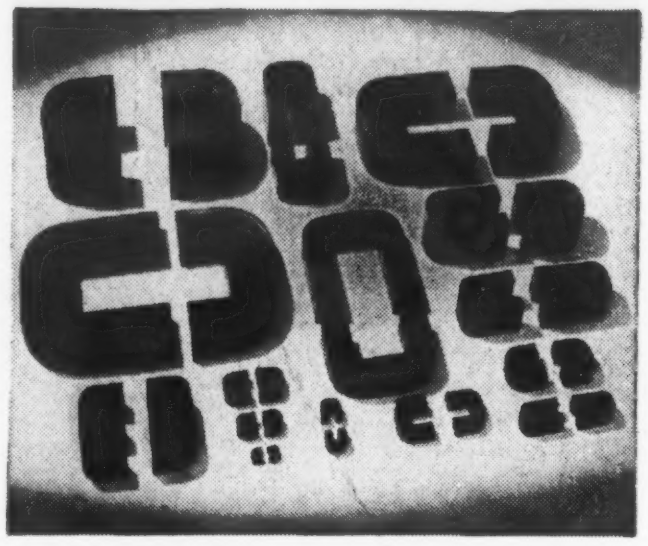
ARNOLD MAGNETIC MATERIALS

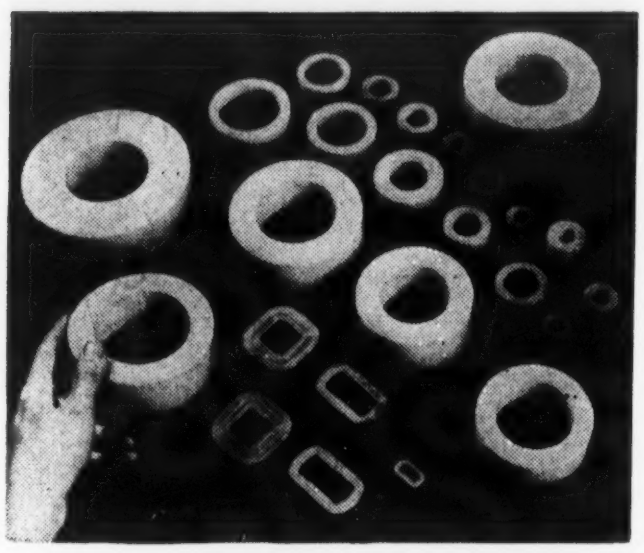
TYPES "C" AND "E" CUT CORES



Arnold "C" and "E" Cores are made from precision rolled Silectron strip (highly oriented silicon steel) in 1, 2, 4 or 12-mil thicknesses and a wide variety of window sizes and core areas, for high and low-frequency applications. Sizes range up to 10 lbs. in 12-mil strip, and from fractions of an ounce to hundreds of pounds in the thinner gauges. Cores wound from ultra-thin strip (down to ¼ mil or less) can also be supplied.

Insulated strip of the proper width is wound on a mandrel, then heat treated, bonded and cut into halves. Careful control results in accurately dimensioned and matched core halves whose effective air gap at the butt joint is very small.

In 3-phase applications, the use of "E" Cores provides weight and size reduction, as well as higher efficiency and possible cost savings. Rigid standard tests are employed for both "C" and "E" types of cores, and special tests where required.



TAPE WOUND CORES

Depending upon the specific properties required, Arnold Tape Wound Cores are available made of Deltamax, 4-79 Mo-Permalloy, Supermalloy, Mumetal, 4750 Electrical Metal, or Silectron . . . in standard tape thicknesses of 1, 2, 4 or 12-mils, and in ultra-thin gauges of ½ and ¼-mil where required.

Practically any size core can be supplied, from a fraction of a gram to hundreds of pounds. Toroidal cores are made in 22 standard sizes with protective nylon cases. Special sizes of toroidal cores, and all square or rectangular Tape Wound Cores, are manufactured to meet individual requirements.

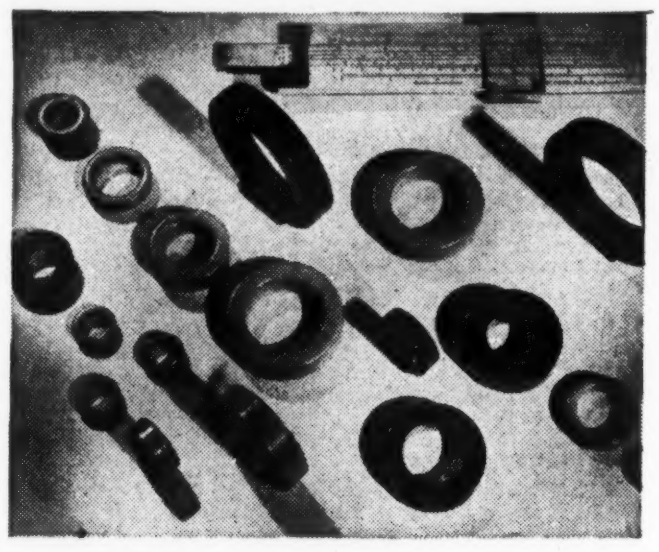
Used for magnetic amplifiers, pulse transformers, current transformers, wide-band transformers, non-linear retard coils, peaking strips, reactors, etc., this gapless type of core construction results in maximum effective working permeability with minimum flux leakage.

MOLY-PERMALLOY POWDER CORES

For use in loading coils, filters, broadband carrier systems and networks, for frequencies up to 200 kc, these Toroids provide high Q in a small volume, and are characterized by low eddy current and hysteresis losses.

Arnold Powder Cores are supplied in four standard permeabilities: 125, 60, 26 and 14 Mu. They provide constant permeability over a wide range of flux density. The 125 Mu cores are recommended for use up to 15 kc; the 60 Mu at 10 to 50 kc; the 26 Mu at 30 to 75 kc; and the 14 Mu at 50 to 200 kc. Many of these cores may be furnished stabilized to provide constant permeability (±0.1%) over a specific temperature range.

These Moly Permalloy Powder Toroids are available in a wide range of sizes, to obtain nominal inductances as high as 281 mh/1000 turns. They are given various types of enamel and varnish finishes, some of which permit winding with heavy Formex insulated wire without supplementary insulation over the core.



ALNICO MAGNETS

Arnold manufactures permanent magnets from all grades of Alnico, although Alnico V is usually the preferred type due to the high value of energy product of that alloy. Alnico Magnets are quite hard and somewhat brittle and may be machined only by grinding. Most sizes and shapes are manufactured as sand castings and are made to the customer's drawings and specifications. Some types and shapes of Alnico Magnets are carried as stock items.

Some small sizes of magnets may be furnished in sintered Alnico, but special shapes made in this way require rather expensive dies.

Stock sizes of all the products above are listed in Catalog GC-106. Write for your copy . . . but if you're attending the IRE show this year, see us at Booth 148.

W&D 4869

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How Lewyt engineering licked a 10,000 rpm stumbling block to mass-produce radar test equipment!

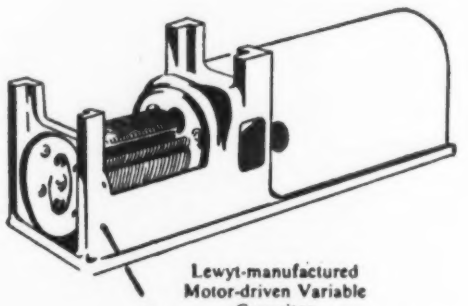
Before the TS-452 Signal Generator existed, technicians had to check the frequency response of radar system networks with a point-by-point plot of frequency amplitude curves.

Each plot took as much as 30 minutes. Checking and readjustment were long, tedious jobs.

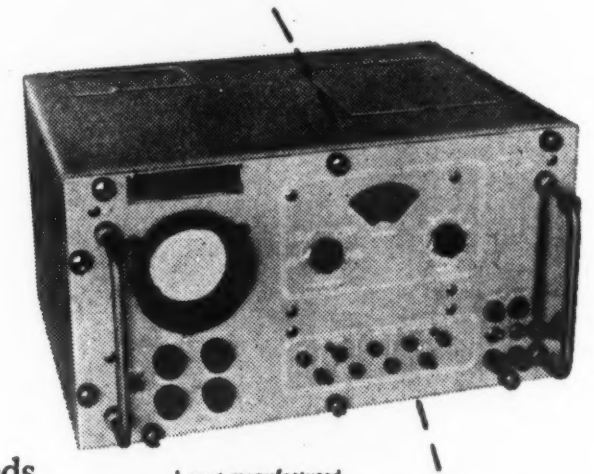
To overcome these problems, specifications were drawn up for a Sweep Signal Generator that would permit an instantaneous check of frequency response. However, two major problems presented themselves:

1. A motor-driven variable capacitor had to be designed that would rotate up to 10,000 rpm. The best obtainable could operate at only 500 rpm. Some flew apart in minutes, some in a few hours.
2. A highly accurate push-button RF attenuator was also required. It had to be of such range and accuracy that the specification requirements could not be met by existing measurement techniques.

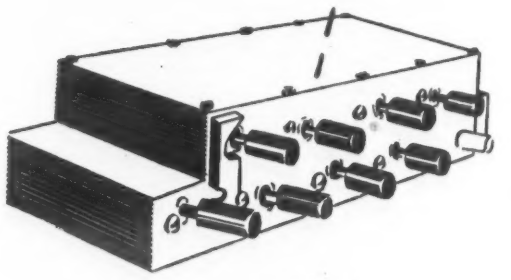
At this point, Lewyt engineering went to work. The resulting TS-452 B/U has since become a "must" for maintenance of all Armed Forces radar installations. With it, technicians can make and observe corrections in split seconds!



Lewyt-manufactured Motor-driven Variable Capacitor



Lewyt-manufactured TS-452 B/U Sweep Signal Generator Radar Testing Equipment



Lewyt-manufactured Push-button RF Attenuator

LEWYT

To make this possible, Lewyt designed a motor-driven variable capacitor that rotated at 10,000 rpm for several hundred hours without a quiver—maintaining its electrical calibration at all speeds. *It is probably the world's fastest rotating variable capacitor!*

Lewyt also developed a high precision attenuator with an accuracy over the frequency range not attained before. *New techniques and standards for testing it had to be devised by the Bureau of Standards!*

In addition, Lewyt engineering designed the unit with functional sub-assemblies, simplified circuitry and controls, a minimum of components—all making for easier maintenance and trouble-free performance.

Another challenging job successfully completed—one of many in Lewyt's 66 years of engineering and manufacturing for Government and Industry.

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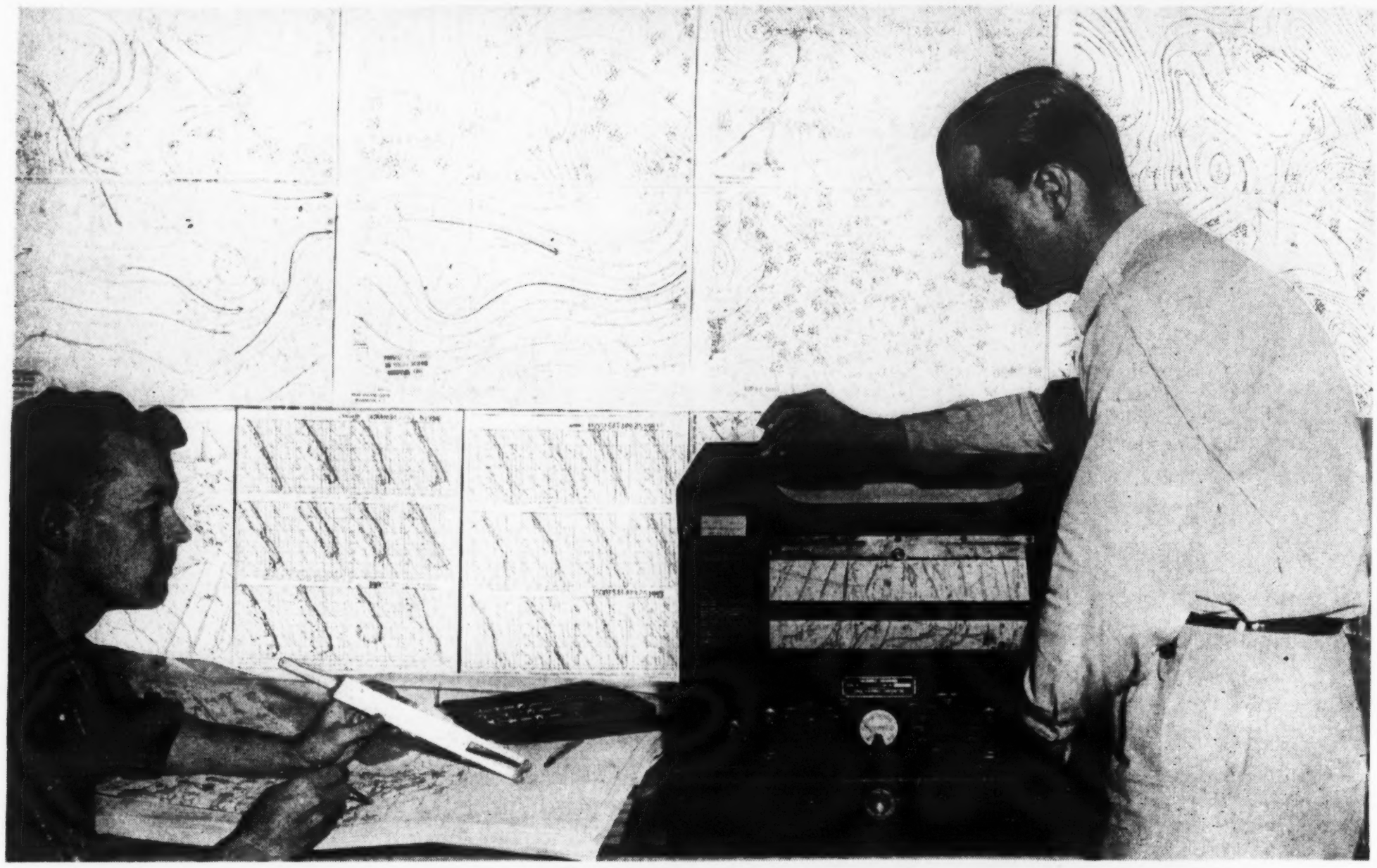

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. . . for fast, accurate reception of plotted weather maps and forecast data. This is essential to the services they render their clients, Gulf Coast oil and sulphur operators.

The pictures at the left and below show the construction of an offshore drilling platform under ideal wave, wind and weather conditions. During heavy seas, however, construction operations must be discontinued because of the relative motion between the stable platform and the floating vessel. Accurate local weather forecasting, therefore, becomes of great value.

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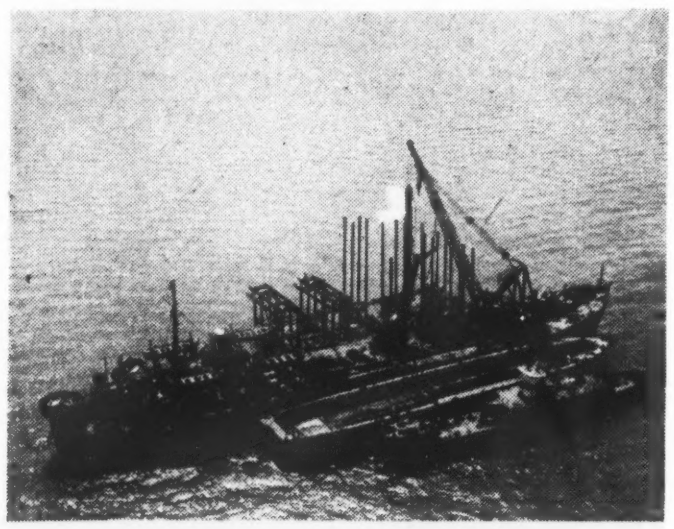

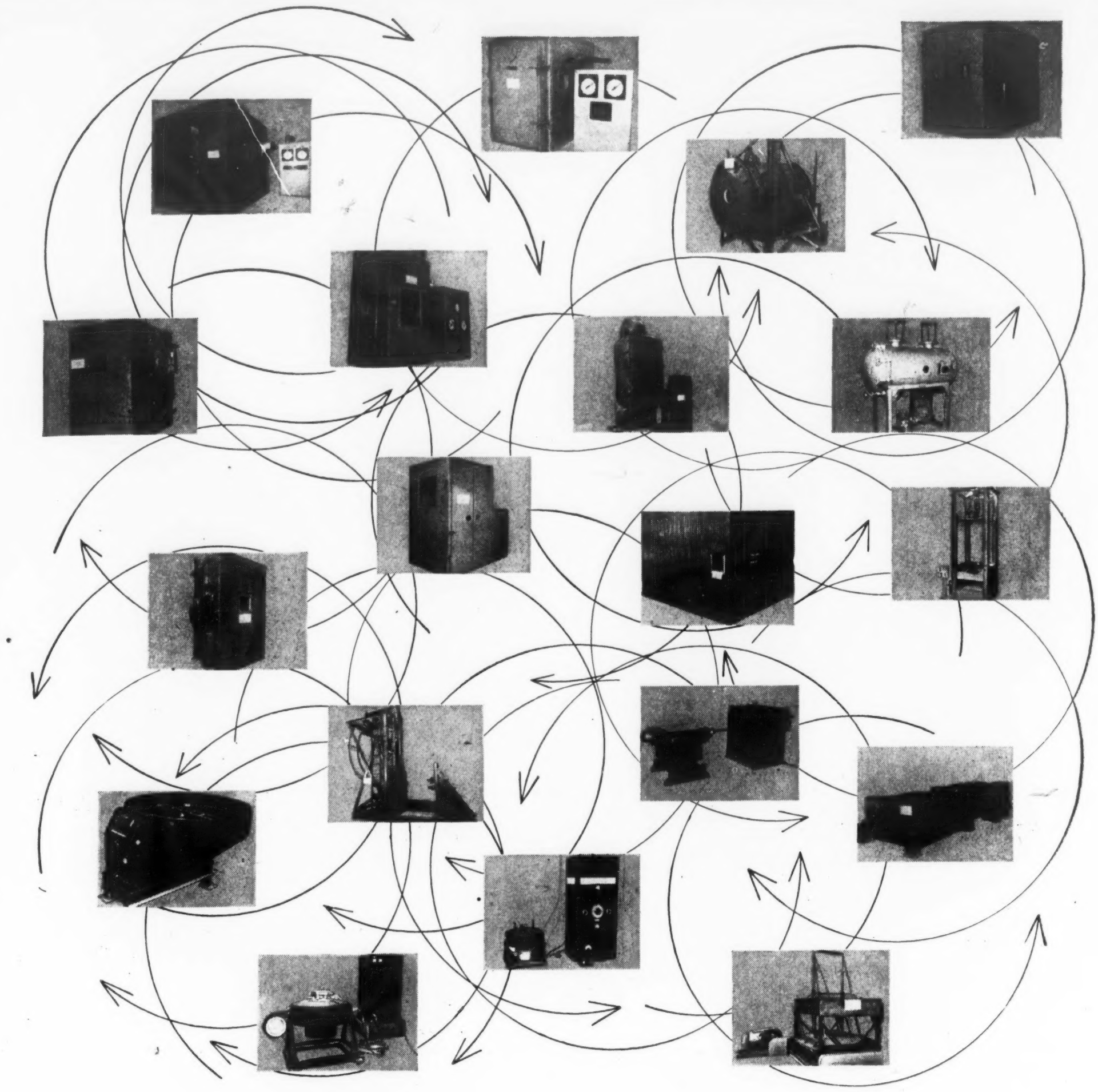

19 chambers of hell

You are looking at the units of a $2,000,000 Martin testing laboratory—part of a man-made hell of fire and water, shock and vibration, explosion and corrosion, designed to torture *electronics equipment!*

For these vital components of today's aircraft, guided missiles and weapons systems must carry tremendous responsibilities. Consider, for example, the electronic system of the Martin B-61 Matador:

Incredibly versatile, it comprises the entire brain and nervous system of America's first successful pilotless bomber. Yet this sensitive equipment must withstand the shock of many tons of thrust in the first second of take-off—violent changes in temperature and pressure—and ground conditions ranging from sand storms to arctic blizzards, desert dryness to tropical downpour.

Today, Martin's facilities are among the finest in the world for design, production and proving in the field of avionics...one of the major developments of Martin Systems Engineering which is now tailoring airpower to previously impossible requirements.

You will hear more about Martin!

Martin AIRCRAFT

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I introduce your wife to AFCA at the 8th Annual Convention May 6-7-8 in Washington
Mrs. Joseph Redman has planned a special program for the ladies.

Memo to SIGNAL Readers:

We're calling this issue of SIGNAL the pre-convention number — it's the last one to reach you before the 1954 AFCA Convention, which, as you know, is scheduled for May 6, 7, and 8 here in Washington.

Around national AFCA headquarters you'd think it was already upon us, for we are all busy with convention plans and correspondence. Our phones ring continuously, with inquiries, with suggestions, and with new ideas developed by Chairman Percy Black's hard-working convention committee. The Washington D. C. Chapter is, of course, our official host this year.

Yes, it's convention time coming up, just as sure as Spring is in the air — and Spring comes early to Washington. We hope that many of you, and your wives, are planning to come to the convention this year. Elsewhere in this issue of SIGNAL you'll find details about events, speakers, programs, etc. A warm welcome is extended to all AFCA members and their guests, and we really believe that you'll enjoy and profit by every minute of this 1954 AFCA Convention.

Washington is the natural place to hold the convention this year — a year so full of history-making events. Here is the hub, the nucleus, from which all plans must radiate — here a roster of speakers nowhere else available — here industry, the services, and our "average American citizen" must look for guidance and direction.

And, in the words of my good wife, "Washington, beautiful at any time — in snow or rain or humid summer weather — is at its loveliest in Spring: the great avenues, tunnels of green under the ancient elms; the inspiring memorials and magnificent buildings framed in fresh new green; the highways and parks abloom with dogwood, magnolia and azaleas. Washington stands proudly and beautifully foremost among the Capitals of the world."

The Shoreham is one of Washington's best known and luxurious hotels. Located on Rock Creek Park near Connecticut Avenue, it offers ample space for banquets, luncheons, exhibits, meetings, and excellent suites — rooms and food at reasonable prices. Make your reservations as early as possible.

We'll be looking for you — be sure to say "Yes" on your return post-card!

The Editor

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954

First of two parts

CIVIL WAR SIGNALS

This important and interesting paper was presented at a recent meeting of the Washington, D. C. Civil War Round Table. We are publishing this talk for the general interest of our readers, but in particular as a tribute to the Signal Corps which celebrates its 94th birthday on June 21st.—Ed.

by Dr. George Raynor Thompson

Chief, Signal Corps Historical Division

MILITARY SIGNALS IN THE CIVIL WAR can be said to have begun when the Army's one and only signal officer, A. J. Myer, was sent to Washington on orders dated 5 May 1861.

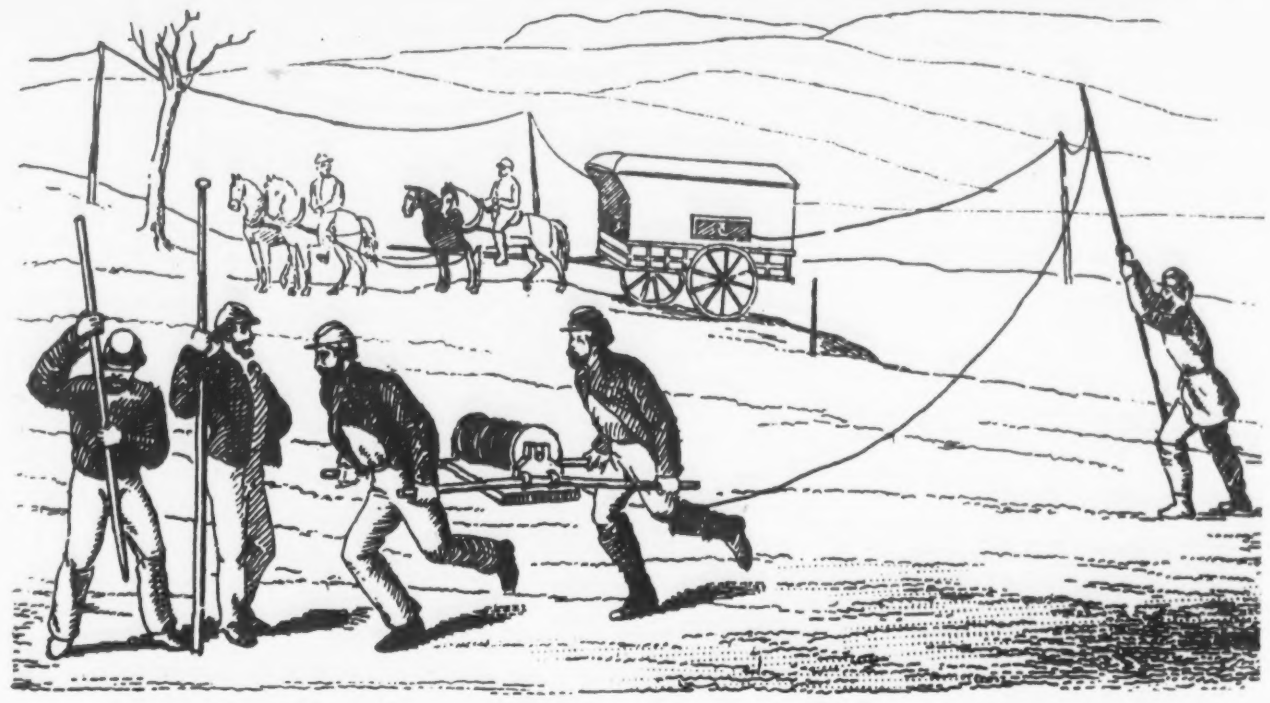
To go back of that date a bit, Myer had been an army surgeon, with an interest in the deaf and in sign language. He had worked out a system of visual signaling using a flag by day and torches by night. War Department interest in the system won Congressional approval and $2,000. On 21 June 1860, Congress authorized the appointment of the first Signal Officer and on 2 July 1860 the Army appointed "assistant surgeon Albert J. Myer to be Signal Officer with the rank of Major to fill an original vacancy."

Signal officer Myer at once began service in his new capacity in the Navajo campaigns in the American southwest. The officers and men with whom he worked were detailed from other arms and services. One was Lieutenant William Nicodemus, of the 5th U. S. Infantry, who would later replace Myer himself as the Chief Signal Officer of the Union Army, in consequence of a disagreement over who should control wire telegraph trains in the field, whether the Signal Corps should exercise control or civilian telegraphers answerable only to the Secretary of War. Two others of Myer's students became prominent Confederate officers. They were E. P. Alexander, of the Engineer Corps. and J. E. B. Stuart.

This photograph, taken in 1861, shows Major Myer seated at a table (left), surrounded by officers and men on detail at the Signal School at Red Hill in Georgetown, Washington, D. C. Of particular note in the picture are: the wigwag flag behind the group; the assembled flag staff and the bundle of four-foot sections leaning on the table, and the telescopes carried by the officers. The regulation telescope was made of four sections, 26 inch focus, providing a magnification of about 30 times.

When Major Myer arrived in Washington on 3 June 1861, his basic equipment needs required flag kits—a white flag with a red square in the center for use against a dark background; a red flag with a white square for use against a light background — and torches for night use (these of course are the elements which make up the familiar Signal Corps insignia). Telescopes were necessary for reading the flag or torch wigwag motions at long distances, up to twenty miles. The most pressing need which faced the lone signal officer was the necessity to get officers and men detailed to him wherever signals might be required and to train them in the motions of wigwag, which entailed the mastery of codes and ciphers.

The first need for military signals arose at the important Federal fortress in the lower Chesapeake Bay at Fort Monroe. Early in June, Myer arrived there, obtained a detail of officers and men and began schooling them. Soon his pupils were wigwagging messages from a small boat, directing the fire of Union batteries located on an islet in Hampton Roads against Confederate fortifications near Norfolk. Very soon, too, Myer began encountering trouble with commercial wire telegraphers in



A drawing from Myer's "Manual of Signals" illustrating the field, or flying, telegraph. It shows the wagon with batteries and instruments. The wire (in this case presumably bare copper, since it is being strung on insulators on poles) is being run out from a reel carried by two men. The linesmen are using a crowbar to open holes to receive the lance poles. Myer estimated that 2½ miles of such wire line could be put up in an hour.

the area. General Ben Butler, commanding the Federal Department in southeast Virginia, ordered that wire telegraph facilities and their civilian workers be placed under the signal officer. The civilians, proud and jealous of their skills in electrical magic. objected in no uncertain terms and shortly an order arrived from the Secretary of War himself who countermanded Butler's instructions. The Army's signal officer was to keep hands off the civilian telegraph, even when it served the Army.

Within a few weeks the Army's signal needs at Fort Monroe were overshadowed by a much greater requirement. The forces now marshalling in Northern Virginia threatened battle. Arrangements for Federal signals, at least for wigwag lines, were begun too late, when on 17 July 1861 Major Myer was ordered back to Washington to serve with General McDowell. The battle of Bull Run was fought four days later, before Myer could get together and train any signalmen or set up any signal stations in the field.

On the fateful day, Sunday 21 July, the lone signal officer of the Federal Army was entangled with a balloon. The government had previously taken steps to acquire a balloon for observation. The balloon had been inflated in Washington from the city's gas mains, and it fell to Meyer, commanding a detail of 20 men and a wagon, to tow the big bag to the front so that an observer in its basket might survey the battlefield and make reports to General McDowell. The procession started along Pennsylvania Avenue in the wee small hours that Sunday morning, thirty hours later than McDowell had intended. Holding down a sizable balloon and moving it forward proved difficult, more so for these raw recruits tramping along tree-lined rural roads into Virginia than for the trained ground crews which serve Macy's Thanksgiving Day parade down Broadway. By noon the strange retinue had gotten little nearer the now fevered battleground than Fairfax Courthouse when the big bag became hopelessly entangled in tree tops, was torn and deflated. Major Myer hurried on alone to report to General McDowell's headquarters. It was no doubt such experiences as these, in particular a still more unfortunate carelessness regarding signals in the Chancellorsville campaign, which led Myer to specify in his *Manual of Signals*, that the Signal Officer must always be informed beforehand about his General's battle plans, if he is to be able to make appropriate signal arrangements.

Signal Corps accounts scarcely mention this balloon fiasco. Yet considerable evidence exists that the War Department originally intended to make great use of balloon observation and reporting. This particular bag had been built on War Department orders by an experienced aeronaut, John Wise, of Lancaster, Pennsylvania. There is some evidence that General McDowell planned that the balloon should ascend in Centerville by dawn of 20 July, carrying a signal officer to observe the Confederate lines and to signal his observations to the General's headquarters. In fact Myer himself had asked that he be put in charge of handling the signals from the balloon's basket, saying that whether wire telegraph or flag methods were used, it was his duty to arrange for them. Possibly it was because McDowell expected to use the balloon and one signal officer in it that the General failed to make any other preparations to provide ground flag and torch stations. As matters turned out, the balloon train met disastrous delay and entanglement. The Union army engaged with the Confederates without adequate communications on the field and with inadequate civilian telegraph, the nearest station being considerably in the rear, at Fairfax Courthouse.

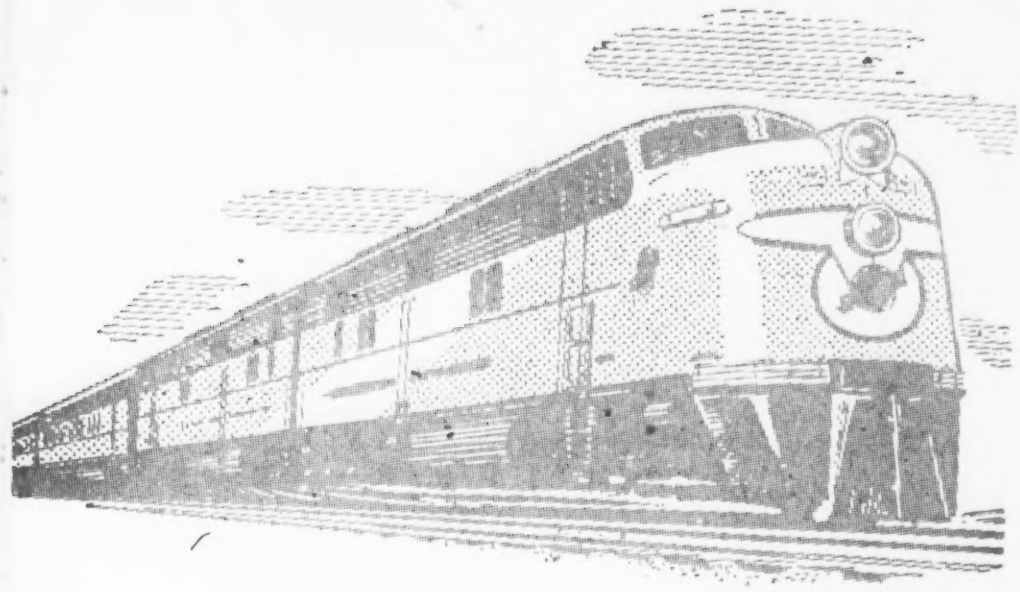
On the Confederate side of that first battle of the war Myer's system of signals succeeded very well, in the hands of E. P. Alexander, formerly a student of Myer and now a captain in grey. Having arrived in Manassas early in July, Alexander had had time to drill signalmen and to set up signal stations along Bull Run. He himself early on the morning of the battle stood at his main signal station near Union Mills Ford. As he watched through his telescope a station which he had placed on the Confederates' left wing near Stone Bridge he glimpsed the gleam of a brass field piece several miles farther along Bull Run north of Sudley's Ford. Closer inspection revealed an advancing Federal column. Alexander wigwagged at once to the Stone Bridge station warning that the left wing was being turned. Next he signalled to Generals Beauregard and Johnston who were several miles downstream from Stone Bridge. These warning messages hastened the Confederates to send up the troops which later in the day helped drive the flanking Federals back in defeat.

Thus the fortunes of war in this battle saw Myer's system of signals succeed, ironically on the side hostile to Myer. Because of general unpreparedness and also some disinterest and ignorance, the North had neither wigwag signals nor balloon observation. What then of the telegraph, which Myer called the electric telegraph in contrast to what he termed "aerial" telegraph, meaning flag or torch wigwag?

Telegraph communications since their invention some 25 years earlier had developed through the cities along the eastern seaboard under the American Telegraph Company. They had developed along the railroads through the

(*Continued on page 76, col. 2*)

Also from the "Manual," this drawing pictures torch signal procedure. Here the foot torch is replaced by a wood fire, providing the reference or center point of light, to the right and left of which wigwag motions are made by means of the flying torch.



Communi

Railroads and electrical communication have gone hand in hand in the development of freight and passenger transportation.

WHEN COMMUNICATION BY ELECTRICITY became a reality, the railroads were immediately interested. This new method of communicating promised to overcome a great obstacle to their progress, for previously sending a message the length of any large railroad by a non-electrical means had required a day or more whereas electricity could do it in minutes. Since the right of way required for pole lines to carry the wires was already available, the railroads were soon in the communications business on a large scale.

Throughout the early days the great majority of messages were handled by hand keyed Morse telegraph. The effect this mode of communications had is brought out by the following quotation from the book *The American Railroad* published in 1888: "The application of the magnetic telegraph to railways wrought the first great revolution in despatching trains, and introduced an element of promptness and safety in their operation of which the most sanguine of railroad advocates had never dreamed." To the average passenger the click of the telegraph sounder in the station soon became almost as much a part of railroading as the trains themselves.

As the art progressed and new devices and inventions came forth they soon found their places. Some of the more important of these include the telephone, the teletypewriter, the telegraph and telephone repeaters, carrier equipment, radio.

A description of the present communications plant on the New York Central System will serve to illustrate the number and type of facilities and equipments to be found on the larger railroads.

The outside plant of the New York Central includes some 9,127 miles of pole line, carrying 77,503 miles of open wire. This open wire, usually 0.114 copper, is the backbone of the telegraph and telephone network and is supplemented by lengths of cable

Mobile radio installation in a caboose.

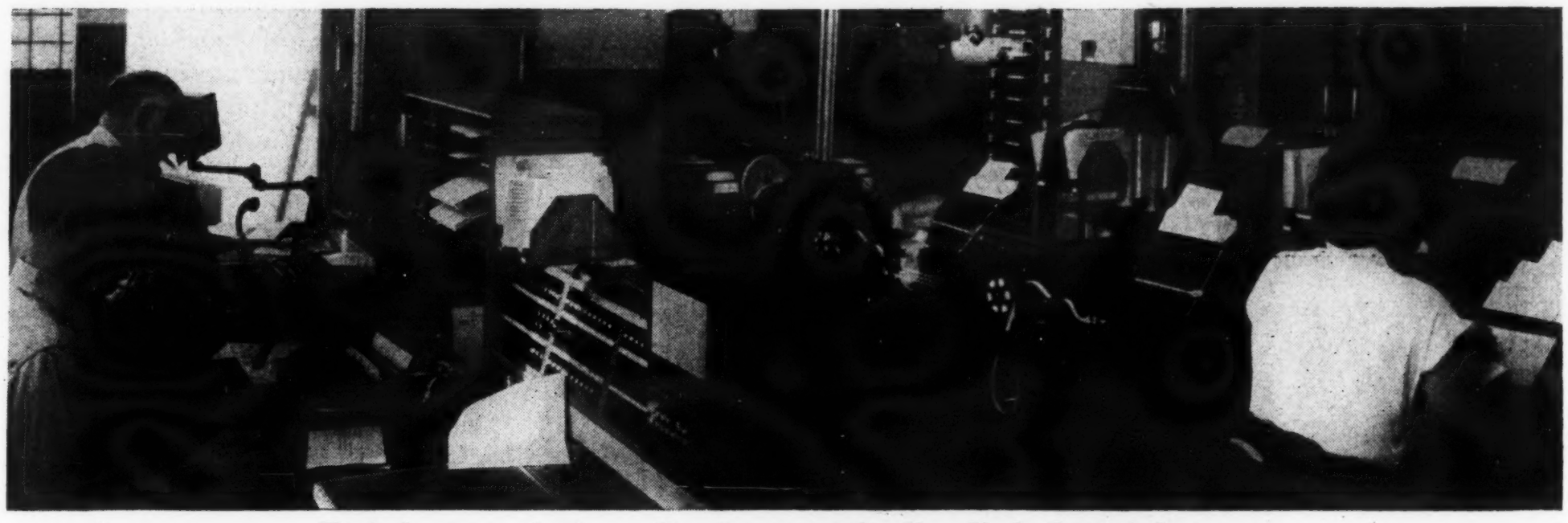
in the larger cities and highly industrialized areas.

The telephone circuits are divided into the general categories of operating and administrative. The most important of the operating group are the dispatcher's circuits, which are long party lines running the length of a railroad division. The dispatcher is located at one end of this circuit and through contact with the other parties located in the various stations and signal towers along the line, the division keeps track of and controls all trains in the area. A typical dispatcher's position is equipped with a microphone and loudspeaker to relieve the dispatcher of the need for wearing a headset for an eight-hour period. Since the loudspeaker is always connected to the line, outlying parties use voice signaling to attract the dispatcher. The dispatcher contacts the other parties either by voice, if these points are equipped with amplifiers and speakers, or by means of a coded signaling system which transmits low frequency impulses from the calling location to stepping selectors at the outlying telephones. Each selector is adjusted to respond to only one combination of impulses and rings the bell of its associated telephone. This circuit is also brought in to telephone booths and pole boxes which may be located as close as a mile apart on a busy division so that train crews may con-

ni cations on the Railroad

by Leo J. Ritter
President, Detroit Chapter, AFCA

Communications Engineer
New York Central System



Typical communications office layout in the New York Central System.

tact the dispatcher when stopped at a point not near a station or tower.

Other operating circuits include message circuits which are similar to dispatcher's circuits in length, routing and outlying telephone locations, but differ in that these circuits terminate in a communications office and a telephone switchboard. They are used by station agents, communications operators, towermen, section crews, signal and communication maintainers, and other personnel working along the right of way to contact each other and reach points off the division for the purpose of receiving instructions and passing on information.

Also, as the name implies, messages of record, a form of telegram, are transmitted. Twenty cycle ringing is used to signal the telephone switchboard and the previously mentioned low frequency coded system is used by the switchboard operator to contact the outlying points. Wayside telephone circuits are established between adjacent stations and are used by personnel working between these points to report their activities and to obtain information on the movement of trains in the vicinity. Crews have access to this circuit in the telephone booths and pole boxes along the right of way or by using a line tapping pole to establish direct contact with the wires on the pole line. Yard circuits are routed through yard areas for the purpose of contacting yard personnel and are used to pass on the information required in operating the yard.

The operating circuits are all physical circuits except in a few instances where a dispatcher is located at a point not on his division in which case a carrier system is used to "leg" him out to his operating territory.

The administrative circuits are telephone trunks between the larger cities on the railroad. These circuits are terminated in telephone switchboards which are leased from the local telephone companies. This arrangement permits these trunks to be interconnected and connected to telephones in the railroad offices. Calls are placed to handle the multitude of administrative details which arise in the running of the railroad in the same way that toll calls are placed by other organizations who do not have their own telephone facilities. Although

some of these circuits are physical circuits, the majority of them are obtained by using channels of one or more carrier telephone systems.

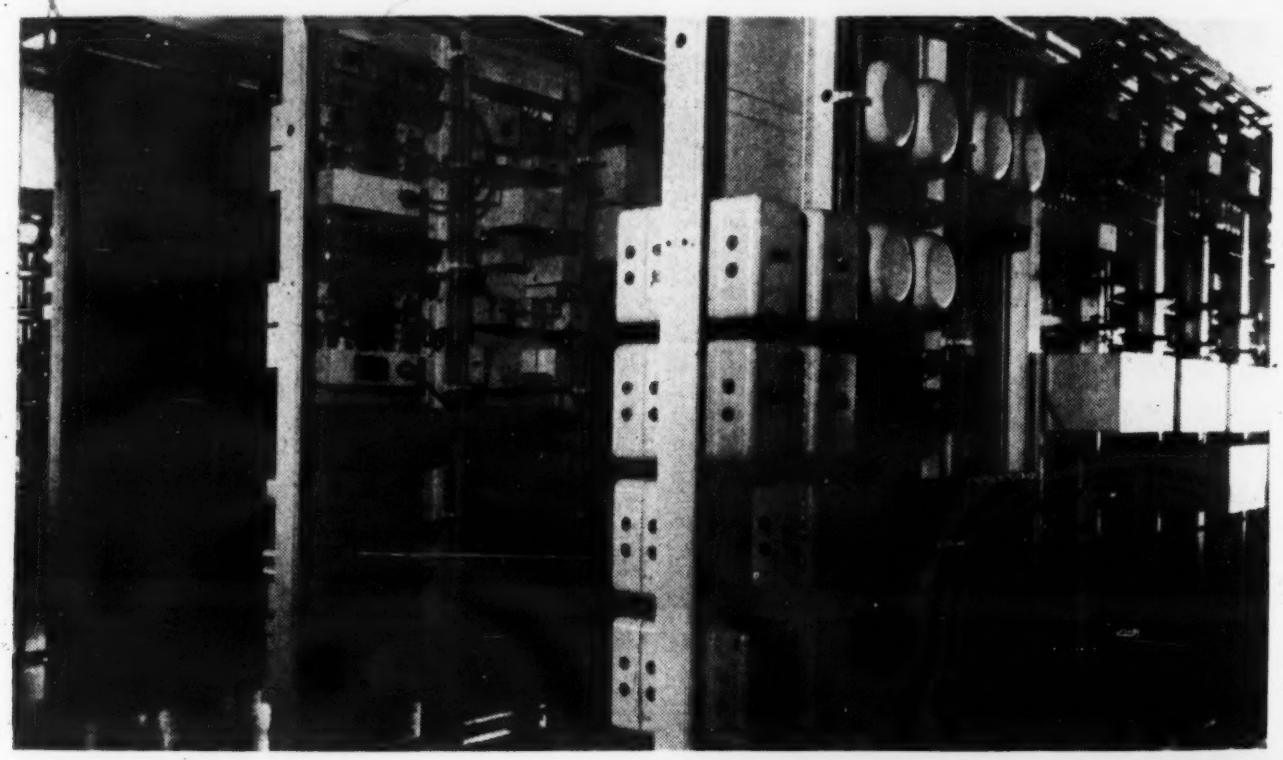
During the year of 1952 nearly 42,000,000 calls were handled over the aforementioned circuits.

Since the time of dispatching trains by telegraph has long since passed, most telegraph circuits are now used for administrative traffic. The majority of these circuits are direct trunks between the more important points on the railroad. Other circuits are arranged on a party line basis to interconnect the smaller way stations. The direct trunks are obtained by using existing single wires, simplexing existing telephone circuits, or using channels of one or more carrier telegraph systems. These carrier systems are either the 40C1 type which provide up to twelve telegraph channels, or single or dual channel systems which are operated on a "speech plus duplex" basis on a carrier telephone circuit. This latter scheme makes use of a small band of frequencies taken out of the voice frequency spectrum required for the telephone circuit resulting in two way telephone and telegraph operation in the original voice frequency band. The trunk circuits are all terminated on the teletypewriter equipment usually consisting of a perforator, transmitter-distributor, and receiving printer at each end of a two way or duplex circuit. Reperforators are used in many locations where incoming messages must be retransmitted and to assist in emergency circuit reroutings. The party line circuits are operated using both teletypewriter equipment and hand keyed Morse. Over 500 pieces of Teletype equipment are required for all circuits. In 1952 over 12,000,000 messages were handled over railroad owned telegraph facilities. Also included in the telegraph network are leased circuits to the principal off line points where New York Central representatives are located.

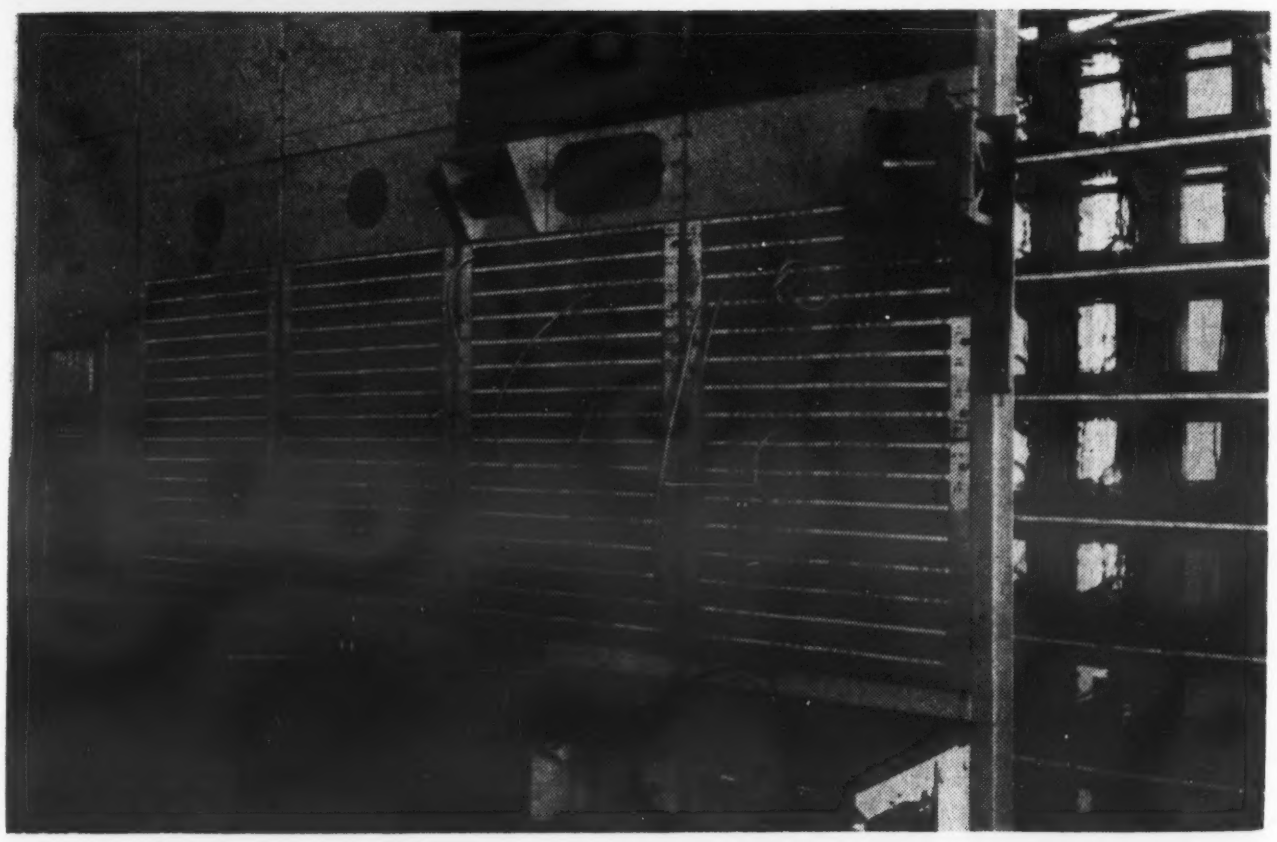
At present radio finds its chief use in yard and similar operations. Through a main station of one of these systems the Yard Master can immediately contact crews in radio equipped engines operating in the yard. This means gives him a very flexible and efficient control over their activities. An unusual system of this type is in operation in the New York harbor which gives the Tug Dispatcher contact with 24 railroad tugs used to move barges and lighters in the New York area. The main transmitter for these 159.51-161.91 mc. systems may have one or more control points and an output power of from 15 to 30 watts. The mobile transmitters have outputs of 10 to 15 watts. At the present time there are over 275 radio equipped mobile units in operation.

For some time passengers on the Twentieth Century Limited have been able to make telephone calls all over the world while traveling between New York and Chicago. This is possible since this train is equipped with radio telephones working in the Bell System Mobile Radio Network.

It is expected that many more radio systems will be placed in service in the future, both in yard service and for new uses including: engine to caboose and train to land stations on the entire railroad. It is also possible that at some remote date the required telephone and telegraph trunks may be provided over micro-wave links instead of the present wire lines.



↑ **Equipment bays in the communications office, showing the wiring side.**



→ **Wire chiefs' test board, for immediate contact with trains and stations in the System.**

A Used Tube May Be Better Than A New One!

by Charles DeVore
Naval Research Laboratory

DON'T THROW AWAY A GOOD USED TUBE. IT'S BETTER THAN A NEW ONE!

That's the conclusion of Dr. Bernard Salzberg of the Naval Research Laboratory, based on the findings of two joint-service contractors.

One of these contracts is with Aeronautical Radio. Inc. (ARINC), which conducts a tube surveillance program at several selected bases of the three services. One of their late 1952 reports covered 2058 discarded receiving-type tubes collected at the Naval Operating Base and the Naval Air Station at Norfolk, Virginia. This total included 1040 tubes from ships, and 1047 tubes from aircraft. Of the total ship returns, 25 percent were found to be in "defect category 750," defined by the contractor as "reported not functioning properly in equipment. Tests o. k." Of the total aircraft returns, 32.8 percent were found to be in defect category 750.

Thus, of the total of 2058 tubes which had been removed from naval shipboard and aircraft electronic equipment as unsatisfactory, or failures, and discarded, 28.9 percent were found satisfactory on subsequent test. Similar results were reported by this contractor as a result of tube surveillances at a major Air Force base, at the Army Communications Central WAR, and at two Army Bases.

These results were confirmed by the second contractor, Cornell University, also jointly supported by the three services. This contractor even more recently reported the results of an analysis of 5669 tubes shipped to them by ARINC, after they had been discarded by the military services and tested by ARINC. Of this total, 676 were transmitting-type tubes for which no test facilities were available. The remainder, 4993 receiving-type tubes, representing 188 different types, was analyzed for nature of defect. Of these, 34 percent were found to have "no defect!"

It may be argued that the above lot of tubes contained many types of tubes which were represented by so few tubes as to make the results statistically unsatisfactory. Unfortunately, that just isn't so. Seven different types of tubes, each in quantities exceeding one hundred, were contained in the original lot. On this basis, the total number of tubes was 2338; of this number, 28.3 percent were found to have "no defect."

How trustworthy are the test results; what kinds of tests are made on the discarded tubes? Well, ARINC results are based solely on tests made in the field by ARINC employees, using standard service tube testers. The tubes collected at the various bases are shipped, after testing, to ARINC headquarters, where additional tests are regularly made on randomly-sampled tubes to check the field reports. At Cornell, the tubes are then subjected to all JAN electrical tests by students, who use laboratory equipment designed for the job. Although the JAN tests are more detailed and more extensive than can be made in the field, cross-checks of results on tubes first tested by ARINC, and then by Cornell, have shown good agreement. It appears, then, that both kinds of tests can be relied on to indicate the good tubes among the discards.

The only exception to this statement might be that the usual tests do not indicate tubes which are "noisy". Tests for this defect are slow, and the results are also often questionable. There is a saving feature, however; only a very small percentage of the discarded tubes are reported by maintenance personnel as "noisy". Furthermore, such tests as have been made on the discards for "noisy" tubes indicate that only a small percentage of the tubes fall into this category.

Just how servious is it, if, as this study indicates, one out of every three discarded tubes is really a good tube? Well, from a money standpoint, the annual expenditure by the three services today for tube replacement is of the order of 100 million dollars. What is more important from a strictly military viewpoint, however, is that discarding good used tubes may impair the combat efficiency of vital electronic equipment. To quote a recent editorial in *The New York Times*, "Real economy is getting the maximum of combat effectiveness from a given expenditure."

Why are good used tubes discarded, and what can be done about it?

The essential causes of the situation appear to be maintenance practices; what else could they be? Here are some maintenance procedures that may be at fault; doubtless there are others, as a systematic study would uncover.

(*Continued on page 77, col. 1*)

Copperweld Open Wire for Rural Telephone Construction

by F. E. Leib
Manager of Sales
Copperweld Steel Company

WITH ALL OF THE RECENT ADVANCES in radio and television, it may seem unusual that open wire telephone lines continue to be the work-horse of our nation's rural telephone system. Nevertheless, this is the case. The low cost and simplicity of open wire lines in rural areas are unsurpassed by any other system.

Today, the demand of rural people for telephones corresponds to their demand of 15 years ago for electric service. At that time only about 10% of the nation's farms were supplied with central station service. Today, nearly 90% of the country's farms have electric service from either power companies or co-ops receiving loans from the Rural Electrification Administration. After deducting statistical variations and individuals who do not desire this type of electric service, it is apparent that the electrification job has approached a practical degree of completion.

This electrification of farms has brought with it the electrical appliances and other conveniences of urban life. Quite naturally, it has also led to an unprecedented demand for telephone service. Today, about 40% of our farms have telephone connections, but one-half of those are not what would be considered adequate telephone service by urban standards. It is interesting, too, that some fifteen years ago the figure was about 25%, much higher than the corresponding figure of 10% for electric power at that time. The rate of rural telephone expansion has lagged far behind power in recent years.

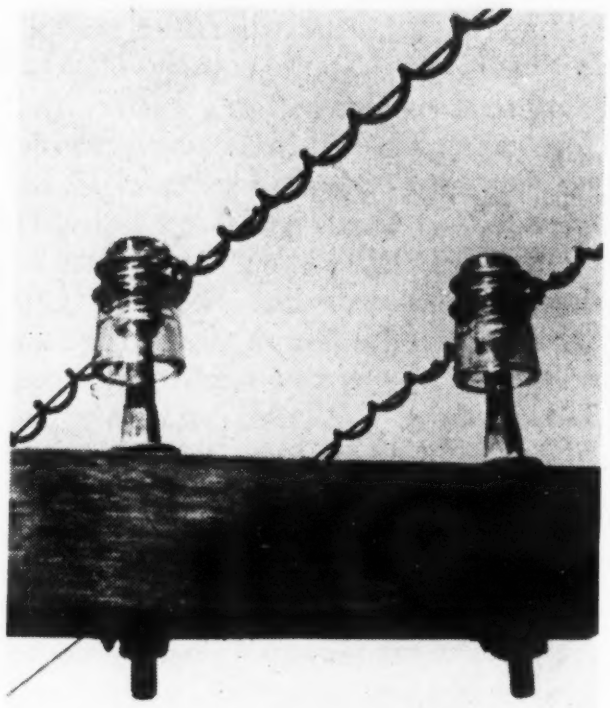
For many years the Independent Telephone Companies and the Bell

Open wire telephone lines are the work-horse of our nation's rural telephone system. Although the electrification of rural areas has almost reached completion, the rate of telephone expansion has lagged behind power development in recent years.

System Companies have been expanding their rural telephone plant as fast as the availability of materials and capital has permitted. But 40% subscriber saturation is not considered a satisfactory proportion in these days of complex and inter-related business and social activities. The job to be done is so large and the demand is so urgent that financial problems can become a severe obstacle. As a result, Congress has decided to aid in the financing through a program of REA loans. It is estimated that 1 to 1½ million miles of new telephone pole line will be needed to bring telephone service to a 90% saturation point. The program will require perhaps 15 years, so that 75 to 100 thousand miles of new pole line must be built each year to accomplish the objective.

With so much line to be built, questions have properly been raised as to whether the overhead open wire line along rural roads offers the most economical coverage. Several alternate plans have received careful study. These were: a radio system between the central office and groups of subscribers, carrier channels over a single voice frequency pair and carrier channels operating over existing 60 cycle power lines. Development engineers have on trial systems of all three types. Considerably more development is required before these systems can be considered as universally practical. For the typical farm customer, it is very doubtful that they will ever be able to compete favorably with the low cost of the open wire communication system. Instead, their use will probably be restricted to special applications.

All interests, Bell and Independent, including REA Borrowers, are planning their major expansion around open wire lines. The open wire will be supplemented with cable systems in towns and wherever the number of open wires tend to make cable more economical and practical.



Where required, Spiral Vibration Dampers may be installed at the insulators or out in the span.

Important factors in the decision for open wire telephone lines have been advancement and economies through the use of long spans and high strength conductors such as Copperweld. This is the same principle that made rural electrification economically feasible. In this way, the cost of outside plant can be kept to a minimum. Coupled with this is the low investment and operating cost of central station and subscriber station equipment when using a voice frequency system as compared to either radio or carrier. The versatility and simplicity of the open wire voice frequency system is universally adaptable for rural application.

Copperweld wire wilil make a tremendous contribution to the rural telephone program, the same as it did in the development of rural electrical service. It will make possible long span construction with the same degree of reliability demanded from old style short span construction. The savings in poles and accessories will be important and at the same time, Copperweld will provide adequate electrical conductance to do the electrical job.

One of the design requirements for rural telephone lines relates to the DC resistance of subscriber circuits. In modern dial systems, the signalling system is operated by a 48-volt common battery. In order to obtain standardized conditions which can be met by all manufacturers of dial switching equipment, a maximum of 1000 to 1200 ohms DC resistance between the central office and the customer's premises is generally used. In .109 inch iron or steel wire, this limits a 2-wire loop to something like 15 miles, whereas in .104 inch, 40% conductivity Copperweld, a 40 mile loop is feasible. 40 miles may seem like a very long loop, but in some of the sparsely settled areas, such lengths are common. Also, the open wire lines are often an extension from cable circuits and the cable circuits can use up much of the allowable resistance. No. 22 Awg cable, for example, uses up the entire 1000 ohms in about 6 miles. If the actual cable run is 3 miles, or half of 6 miles, the allowable length of open wire is cut in half.

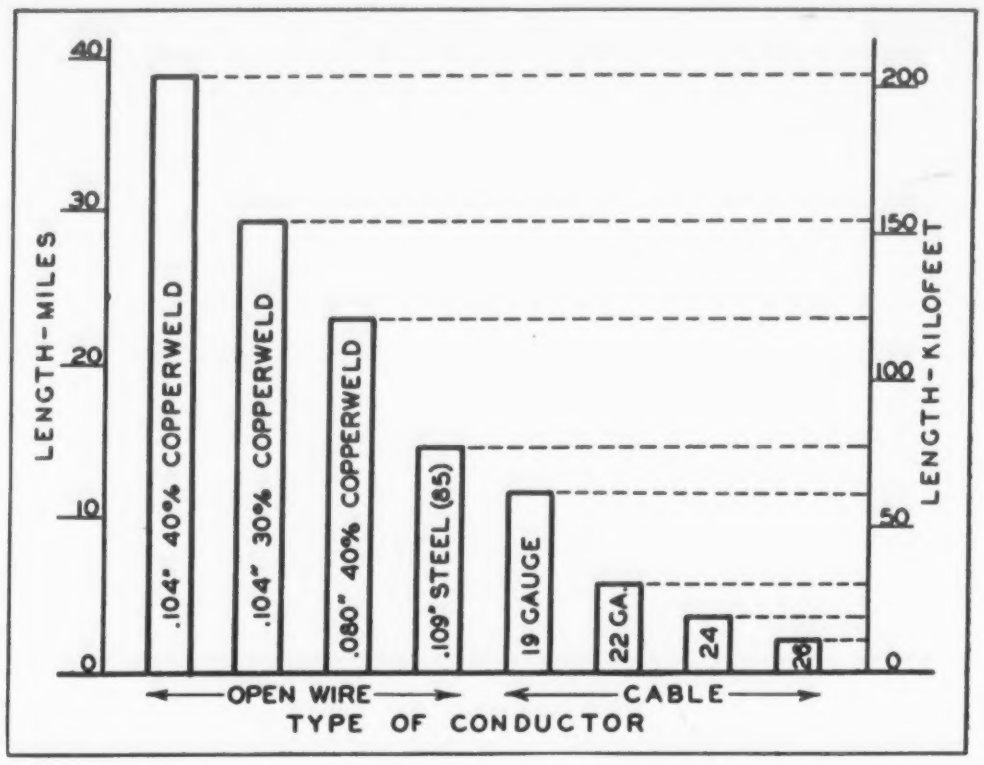
Another electrical requirement is that the talking quality of these rural circuits be as good as the talking quality of urban circuits. This re-

quirement is important because inadequate telephone service can be a serious handicap to acceptance and wider use of telephone service. Also, it is desired that any rural subscriber can be connected to any other subscriber in the United States, or in the world for that matter, and on that basis, the talking properties of rural circuits must be as good as elsewhere.

Conservation Ease Important

In designing for adequate talking properties, the modern method takes into account the effect of distortion, noise, sidetone and loudness or volume. It is in reality a measure of the ease with which the conversation over a telephone can be understood. Through repeated and laborious actual talking tests, a complete and actual Working Reference System has been evolved. Equipment which might be used to replace any portion of the Working Reference System is measured by its transmission efficiency, plus or minus, as compared to the part replaced. This applies to the line circuits, as well as to telephone instruments, repeating coils and the like.

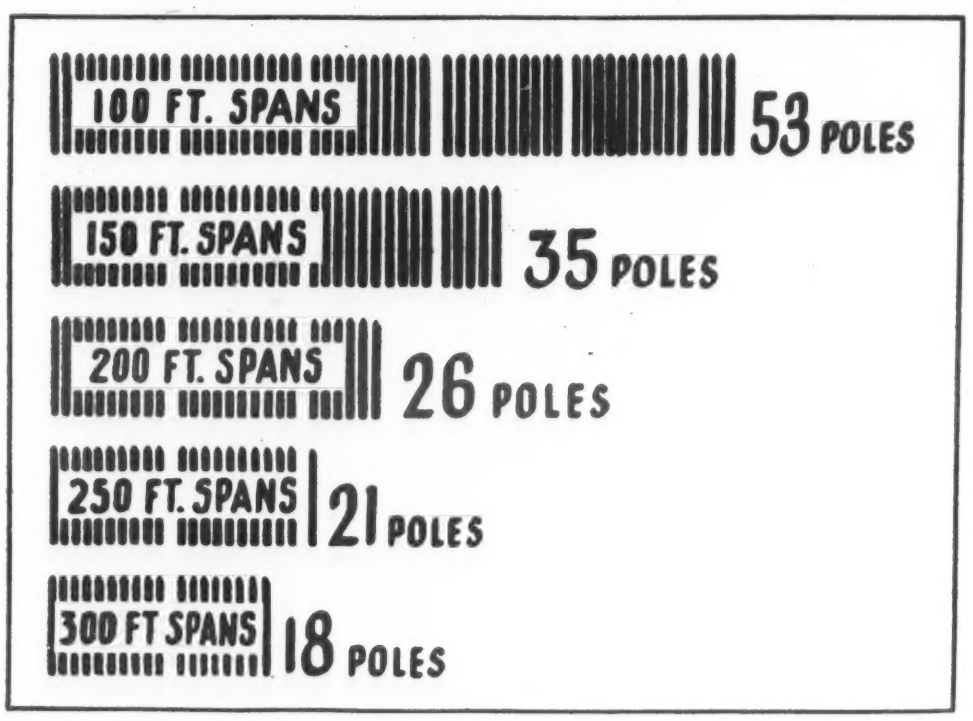
The old method was to compute transmission efficiency by db measurements at 1000 cps, but this is inadequate because good transmission of frequencies both above and below 1000 cycles is necessary for faithful and adequate voice reproduction. In the case of Copperweld open wire, the actual talking performance is considerably better than the 1000 cycle db loss values would indicate. Evidently, this is due to skin effect. The copper, being on the outer surface of Copperweld, is in the best possible location for high frequency operation and its overall efficiency of transmission is good. If the copper covering were not present on the steel core, the frequencies above 1000 cps would be more severely attenuated and the overall transmission efficiency poor.



Copperweld line wire permits long subscriber circuits. (Based on 1,000 ohms D.C. resistance.)

In a rural communication system, there will nearly always be a quantity of cable necessary in the area of the exchange. This may be short, as in the case of cable entrances to the telephone exchange, or it may be relatively longer in order to provide for a large number of circuits to be extended towards the city limits where a multiplicity of open wires would be impractical.

Since the talking properties of cable are not as good as open wire, the length of the cable run becomes an important factor in the wire used for the open wire portion of the circuit. Estimating charts have been prepared for easy application of the Working Reference System to subscriber circuit design. These demonstrate the need for good conductance line wire on the long circuits and also show how open wire conductor selection may be applied to reduce the gauge size of the cable in new installations. For instance, on a 10 mile circuit requiring 2 miles of cable and 8 miles of open wire, the cable must be No. 19 Awg if used with steel telephone wire. But, the smaller and more economical No. 26 Awg size of cable can be used if Copperweld line wire is installed.



Long spans save poles, hardware and accessories.

Mechanical Design Stressed

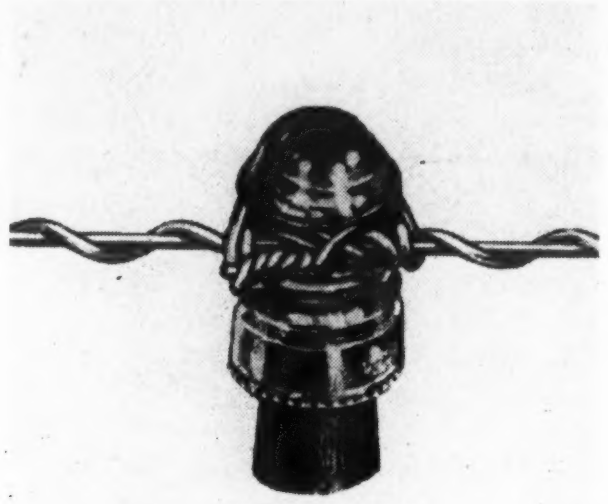
Another important consideration in rural communication systems is the mechanical design. Modern practice leans towards open wire lines to be built in accordance with a fairly strict interpretation of the National Electrical Safety Code. This divides the country in 3 loading areas — heavy, medium and light. Visually, the maximum storm loading assumed for the heavy loading area is ½ inch ice, plus a 56 mile per hour wind; for medium loading, ¼ inch, plus 56 mile wind; and for light loading, no ice and a 70 mile wind. The code expresses these loadings in more complex terms, but the meaning is the same. Generally speaking, modern lines are designed so that with the assumed storm loadings, the conductor is not stressed beyond 75% to 85% of its rated strength. These maximums are somewhat higher than used for rural power lines, but are considered in line with the absence of voltage hazard and the greater simplicity in making repairs to communication lines.

In addition to limits on the stress in the conductor at maximum load, it is also modern practice to restrict normal tensions. In general, values of between 10% and 20% of the rated strength of the conductor are typical. For Copperweld, a value of 14% at 60°F. is being used. This type of limitation is very desirable to minimize the danger of vibration and the chafing or fatigue fracturing that could result. Low normal tensions not only increase the fatigue resistance of a conductor, but they also reduce the tendency of the conductor to vibrate.

A recent development of Copperweld's vibration laboratory is the Spiral Vibration Damper. In certain areas of the country, wind conditions are such that vibration may occur even though normal tensions are limited to relatively low values. In other cases, somewhat higher normal tensions may be desired for clearance or separation reasons and these can create a problem. Such cases are not typical, but where they exist, the use of vibration dampers can be extremely valuable. Field experience with the damper is limited, but exceptional results have been obtained in the laboratory and in all of the field installations that have been made to date.

Essentially, the damper is a preformed spiral of plastic covered wire about 50 inches long and has a loose fit onto the line wire. It makes a multiplicity of contacts to the line wire and opposes resonance.

Another development of Copperweld's laboratory is the Grip-Flex 38 insulator tie. This was developed in 1933 and has been widely used on telephone lines ever since. One notable installation is the Alaska Highway 2200 mile telephone line using .128 inch Copperweld wire, with Grip-Flex 38 ties at each pin insulator. Reports are that there have been no conductor failures at the ties or in the span for that matter, since installation of this line in 1941. Considering the extreme weather along the route, this is an enviable record for both the wire and the tie.



Two-piece Grip-Flex 38 tie uses hard drawn Copperweld helix for reinforcing and soft Copperweld tie wire for binding.

The most widely used Copperweld line wire for rural telephone construction is the High Strength .104 inch, 40% conductivity. It has a breaking strength of 1,283 pounds, and lines having spans of 350 feet in heavy loading, 400 feet in medium, and 450 feet in light loading are common. Typical construction uses 20, 25 and 30-foot poles, not more than two ten-pin cross arms, 12 inch spacing between wires. In sparsely populated areas, brackets of 2 pin or 4 pin crossarms are used.

Strong conductors are needed for safety from snow, ice and wind loads. (Pictures are of Copperweld wires on Alaska Highway Line.)

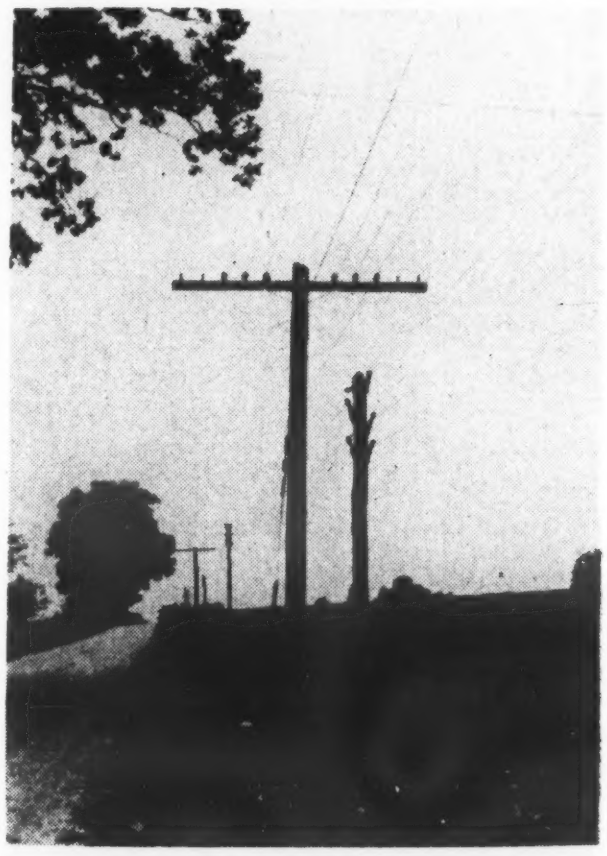
The large majority of telephone line is being constructed on separate telephone poles and located on the opposite side of the road from existing power lines. Sag and tension data are usually prepared by the wire manufacturer for use on these systems. In general, these sags are carefully observed in the field. Staking tables are widely used for ease in laying out the lines on large projects.

Of the open wire transpositions used on these lines, the two-point bracket is probably the most popular. This provides a relatively sharp crossing point between wires and is an improvement over the old steel J bracket formerly used. On voice frequency circuits, transposing is not too critical as to location and the use of long spans entails no hardship.

In addition to the rural subscriber lines, a considerable connecting system of toll lines and inter-city trunks is required. Some of these systems are voice frequency and others, carrier. Copperweld is especially well adapted to these lines where low attenuation is desired at high frequency. Due to skin effect, Copperweld line wire has electrical properties similar to copper and becomes better than copper at the higher range of carrier frequencies. It also has a more uniform resistance over the frequency range and permits use of longer spans, too.

In looking toward the future, we feel that the wide use of Copperweld wire on these rural lines may at some future time be an even greater blessing than would appear at the present time. Currently, these lines will operate at voice frequency, carrying possibly a single message. As telephone communities become more and more developed, there will be need for more and more communications. It follows, therefore, that in the not too distant future, these same rural lines may be called on to carry more messages and other types of service. This will probably mean carrier of one type or another. By using Copperweld on the lines in the first place, the conversion to carrier current lines will be simple when the occasion demands.

Modern, well-engineered telephone lines will use longer spans, better materials and give more reliable service, so greatly needed in rural areas.



Aviation's

CAP Cadets posed on the steps of the Nation's Capitol before leaving for International Cadet Exchange host countries on the program last summer.

by

S/Sgt. Jesse B. Nesbitt, USAF

ANCIENT CITIES — ROYALTY — FOREIGN INDUSTRIAL might. These are some of the things singled out by wide-eyed American youths visiting abroad every summer under the auspices of the International Cadet Exchange.

Overseas as unofficial ambassadors of good will, the young men take with them the uninhibited social conduct of a democracy to the continental behavior of foreign countries and blend the two in a happy combination of native meeting tourist.

In Canada, South America and Europe the American boys get practical lessons in diplomacy, the living conditions of our free world neighbors and international social conduct. They meet the heads of state, mayors and military dignitaries. They attend luncheons and banquets in their honor. They get a first hand look at the latest foreign aircraft and airplane manufacturing techniques.

The brisk hand-shake and accented "How do you do" of the Swiss Air Force chief of staff — an audience with Pope Pius XII — gliding in France — a welcome by King Gustave of Sweden — were all part of Civil Air Patrol's 1953 exchange program.

Meanwhile the foreign cadets were finding their visit to this country equally exciting. "Terrifico!" exclaimed a Portuguese youth on the subject of his flight to America in an Air Force Constellation. "Momma Mia," breathed an Italian as he viewed cars stacked six lanes deep in New York City. The barrage of bright lights flashing on and off in amusement machines drew muttered words of excitement from Greek lads. The crack of a bat mixed with the bedlam of a wildly cheering stadium of fans introduced French and Swiss visitors to baseball in Cincinnati.

This summer 280 teen-agers will be exchanged by 21 countries for three weeks — the largest program to date.

Introduced into the CAP cadet program in 1948 by the national commander, Air Force Maj. Gen. Lucas V. Beau, the exchange has steadily increased in world popularity. This is best illustrated by the growth of participating countries from two — Canada and the U. S. in 1948 — to 21 nations this summer.

Selections for this honor in CAP, and in all the nations of the exchange, are made with the greatest care, using nominations made by cadets themselves, plus the counsel of teachers, ministers and commanders of units to which the youths are attached. So extensive and thorough is this process that months are required for its completion.

For the CAP cadets, the exchange is a summer schoolhouse. Twenty-five youths visiting England last year were surprised to learn that British mayors drew no salary — that commercials are not carried on the British Broadcasting Company's radio or television.

Visitors to Spain saw their first bull fight. In Portugal, market places with their bustling activity won the interest of the young envoys. Ambassadress Clare Booth Luce welcomed the five-cadet contingent to Italy. The fabulous collection of kings' carriages awed the fliers touring Mexico.

Probably the biggest thrill for the CAP cadets occurred last year before they left Washington, D. C. for the host countries. They met President Eisenhower in an informal gathering

Junior Ambassadors

Each summer, the Civil Air Patrol, auxiliary of the Air Force, sponsors a foreign good-will tour for young airmen of tomorrow.

at the White House — an honor for any young American.

The program in the United States was no less interesting for CAP's guests. Following their arrival in the nation's capital they were welcomed by Secretary of State Dulles. They were hosted at the annual International Dinner Party at Andrews Air Force Base, conducted on tours of Washington and then flown in Air Force planes to the host CAP wings (states).

The arrival at the host wings was the beginning of the most important part of the program, according to CAP officials.

Housed in the private homes of CAP members, the visitors enjoyed living as members of average American families.

Many of the boys expressed surprise that their hosts were not "Yank" millionaires, that they found Americans genial rather than generally sadistic, that they failed to see gangsters lurking on every street corner. Instead they went to the beach with Americans their age. They were taken on plane flights. They attended dances and barbeques. They met Mayors, governors and movie stars. They saw baseball games, visited the Civil War battlegrounds in Virginia — and ate the heretofore unknown watermelon and corn-on-the-cob.

During their visit to Italy, United States cadets were introduced to the American Ambassadress Mrs. Clare Booth Luce by the leader of the CAP group, CAP Colonel Barnee Breeskin.

Mayor Walter H. Reynolds welcomed the Italian visitors to Providence, Rhode Island. They later joined the other foreign fliers in New York before returning to their home countries.

The 1953 program also saw an exception. For the first time a female escort officer was among the foreign group. She is Madam Sahiba Gokcen, adopted daughter of Kemal Attaturk, founder of the Turkish Republic. As head of Turkey's air training corps and a former Turkish Air Force major, Madam Gokcen was completely at home with her aviation-minded hosts.

While the exchangees visited on both sides of the ocean and in North and South America, two generals watched reports on the program with special interest. After the visiting youths had departed New York City for their homelands and the Americans had returned to this country, the generals summed up the success of the cadet exchange.

Said General Carl A. Spaatz, chairman of CAP's National Executive Board: "The International Cadet Exchange is a prime example of how the airplane can become an instrument for community living among nations of the world. During its six years much progress has been made toward the dream of world understanding. This annual exchange of aviation's youth from the free nations has made no small contribution to the realization of this dream."

General Beau had this to say. "It (the exchange) serves as tangible evidence of the effect aviation exerts in the shaping of world policies for peace and as a reminder that air supremacy for the freedom-loving nations of the world is the main deterrent to aggression from what ever source it may stem."

RCA Experiments Point to Possible Electronic Control of Cars, Trucks

AN EXPLORATION OF HOW ELECTRONICS can be put to work to reduce highway disasters and to relieve drivers of tiresome tasks on modern superhighways has been initiated by Dr. V. K. Zworykin, pioneer television and electronic scientist of the Radio Corporation of America.

Recent electronic advances, such as the tiny, power-thrifty transitor, indicate that electronic aids to many automobile driving problems are approaching the realm of practical application, according to Dr. Zworykin. Although the day of completely automatic control of automobiles is far off, Dr. Zworykin said, certain electronic devices to assist drivers in such matters as bad weather steering and collision prevention are nearer at hand.

To study the basic problems of automatic driving, Dr. Zworykin and assistants at the David Sarnoff Research Center of RCA, in Princeton, N. J., have equipped a model five-foot car with electronic equipment. This laboratory car, which is powered by a storage battery, can:

1. Steer itself along a prescribed route.
2. Stop itself when approaching a metal obstruction.
3. Turn out of its original lane into a second lane as if to pass another car moving at a slower speed.

In the laboratory set-up, the model car is guided by a wire which represents a cable that would be laid in the roadbed of a superhighway. The wire sets up a magnetic field of a certain frequency which is picked up by the two coils, one on each side of the car. If one coil receives more of the signal than the other it means the car is no longer centered over the wire and electronic equipment controlling the steering wheel immediately brings the car back "on course."

To prevent a collision with an obstruction, simple transitor circuits associated with the guidance wire send out warning signals (of another frequency) whenever an obstruction passes or is stalled over them. These warning circuits, in effect, produce a "radio tail" at the rear of any sizable metal obstruction on the route. When equipment in the model car receives the warning signal, the brakes are automatically applied and the car comes to a halt.

To simulate two lanes in the same direction, Dr. Zworykin has parallel guidance wires with a diagonal wire connecting them. When the model car senses the radio tail of an obstruction in the inner lane, its electronic equipment shunts it along the diagonal into the outer lane so as to pass the obstruction.

A system of warning circuits in the roadbed to produce a "radio tail" when an automobile passes over would be quite impractical with electron tubes, Dr. Zworykin pointed out. Such circuits would be needed approximately every 20 feet and the electrical power to operate the tubes would be enormous, he said. But when transitors are available in large quantity at low cost, he said, such circuits become feasible because power consumption would be reduced a million fold over that required by tubes.

In experiments with the model car, Dr. Zworykin has been assisted by L. E. Flory and W. S. Pike, RCA research engineers.

Discussing the trend toward modern highways on which driving is becoming both simple and tiresome, Dr. Zworykin

Dr. V. K. Zworykin, vice president and technical consultant, RCA Laboratories Division, examines the electronic apparatus of the model car that drives itself. The car has been equipped in a study of problems of avoiding accidents and of automatic driving on superhighways of the future.

said that "the time has arrived for consideration of automatic driving techniques which may relieve the driver of his routine duties whenever his car enters an express highway system.

"Even now," he said, "with power steering, control devices are used to guide the car in preference to direct steering. Similarly, with power braking, the driver supplies a control signal rather than the physical force required to slow or stop the car. The automatic headlight dimmer is another device to take over a routine function of the driver.

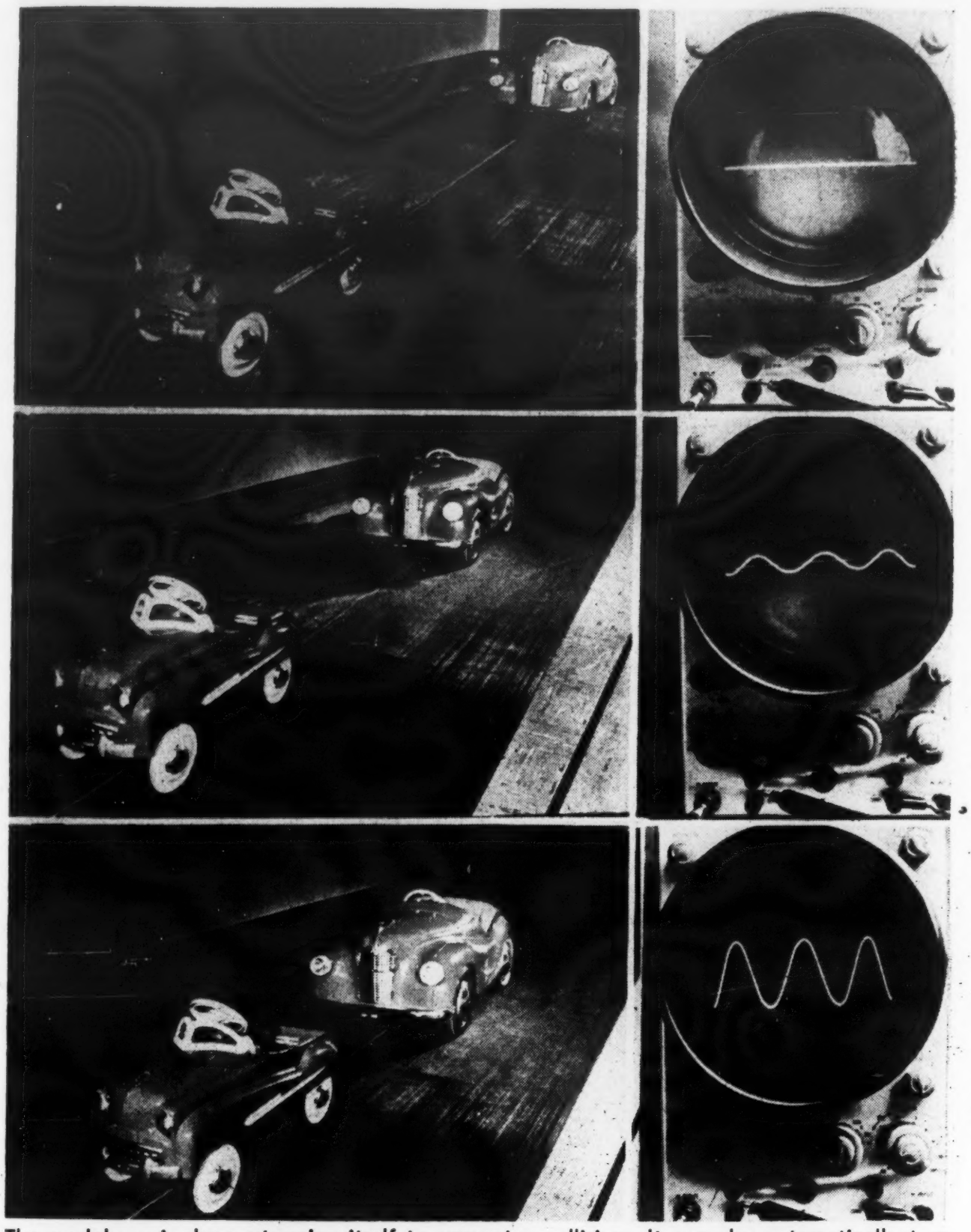
"The number of such devices may be expected to increase and it is not too early to examine ultimate objectives of driving simplification. Long-range advance planning appears essential in this field in view of the large number of parties vitally concerned. Successful development depends on the cooperation of governmental authorities, the highway builder, the car manufacturer and the safety engineer for the benefit of the individual driver and the public at large.

"The basic requirements of an automatic driving system harmonize with trends in modern highway construction," Dr. Zworykin continued. "The requirements are that the roads have at least two lanes in each direction and that crossings and left turns across traffic be eliminated by cloverleafs and similar systems. With these conditions satisfied, the stage is set for a gradual introduction of measures to reduce traffic risks and simplify driving procedures.

"The changes should necessitate neither sudden abandonment of established driving habits nor wholesale installation of new equipment on roads and vehicles. This means: (1) The driver must retain the freedom of choice of speed, within prescribed limits, and of choice of either manual or automatic control. (2) Automatic control systems must be restricted, initially at least, to high-speed long-distance road systems subject to special regulation, such as turnpikes and thruways. (3) Vehicles equipped with automatic driving devices must be able to benefit in mixed traffic, consisting of equipped and unequipped vehicles.

"It is clear that car owners and purchasers will not bear the added cost of the control equipment unless it proves useful under current conditions, namely, with the vast majority of cars under purely manual control. At the same time it would be both politically and economically impractical to restrict traffic on high-speed road systems to equipped cars.

"As a first step, equipment should be provided to enable the driver to keep his vehicle centered on the traffic lane under conditions of fog and poor visibility in general. This may be accomplished by a cable, buried in the concrete, carrying moderate-frequency alternating currents (of the order of 100 kc) and a pair of magnetic pickups



The model car is shown stopping itself to prevent a collision. It can also automatically turn into another lane when another car is in its path. The experimental car keeps itself centered over a wire in the road which radiates a signal. The car at the rear picks up a warning signal, set off by the metal of the parked car in front. Oscilloscope pattern at the right of each picture shows how the warning signal received in the rear car gets stronger as it nears the danger point.

mounted on the car. The difference in the signals derived from the two pickups may be used either to indicate the off-course position of the vehicle on the dashboard or applied directly to the steering mechanism so as to maintain the car in the center of the lane. Feedpoints for the cable may be provided at intervals along the highway.

"In this system the driver not only would retain complete control of the car speed, but, in addition, could switch at will from manual to automatic steering. The automatic setting could be linked to an external indication on the car to inform road supervisors and other drivers of the fact that the car is under automatic control.

"The second step in the evolution of the automatic driving system, the prevention of collisions, is a natural extension of the guidance equipment.

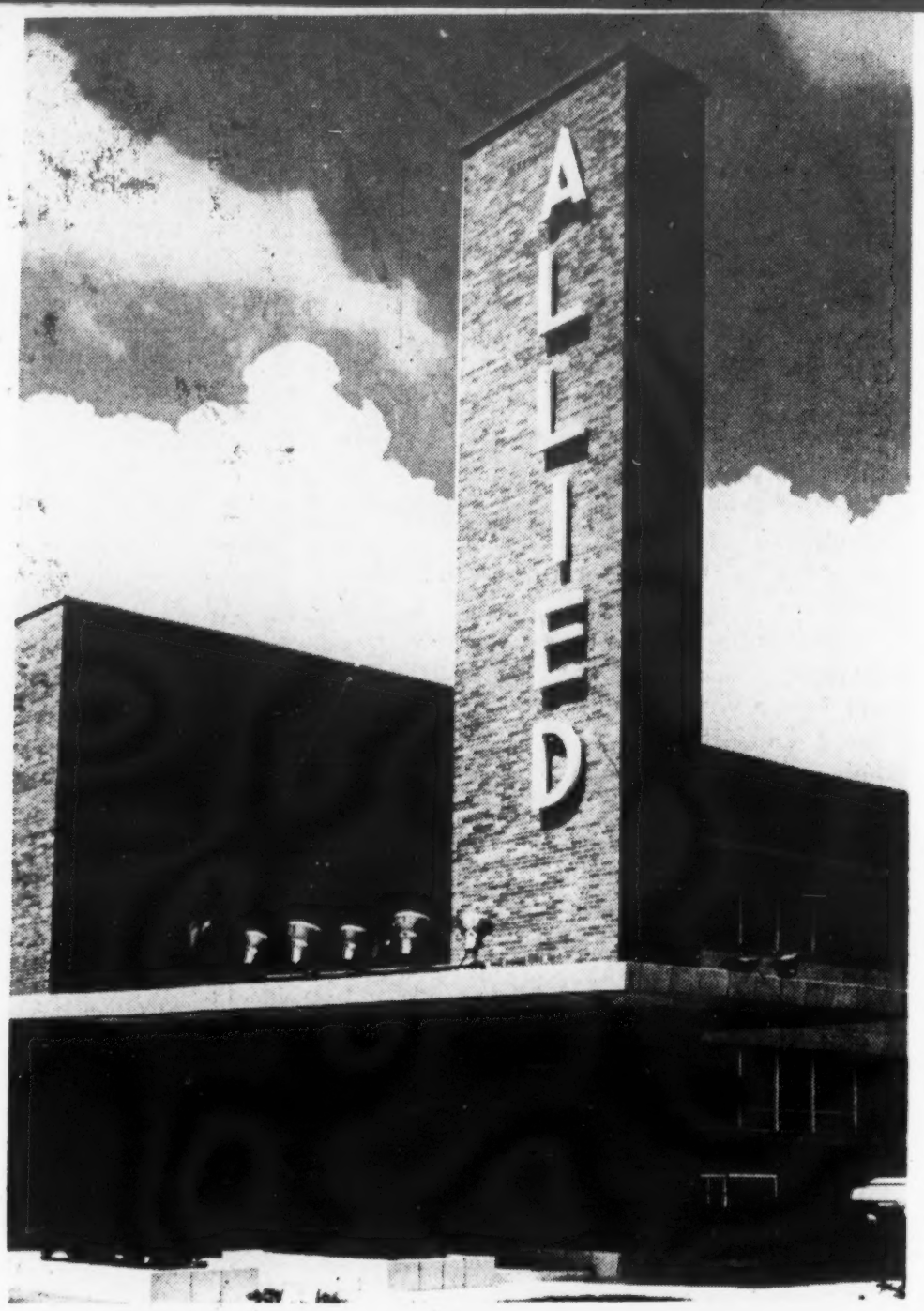
"The essential feature of one proposed collision prevention system is the transfer of energy from a high-frequency power cable, to a series of tiny oscillators or transmitters along the lane. The transfer of energy is controlled by the passage of a car and a long time constant circuit or 'memory' causes the transmitter to function for a time after the car has passed. The oscillations are transmitted backward along a high-attenuation cable and sensed by pickup coils on the following cars. Thus every car, whether equipped with automatic driving devices or not, would be followed by a 'flying tail' of warning signals. Their amplitude would increase as the car slowed down and become a maximum for a stalled car. Conversely, the sensing system of the following cars would be coupled with the car speed indication in such fashion that the warning signal would increase with their speed.

"In a completely automatic system this warning 'tail' could be used to switch a car from one lane to another

(*Continued on page 76, col. 2*)

ALLIED RADIO

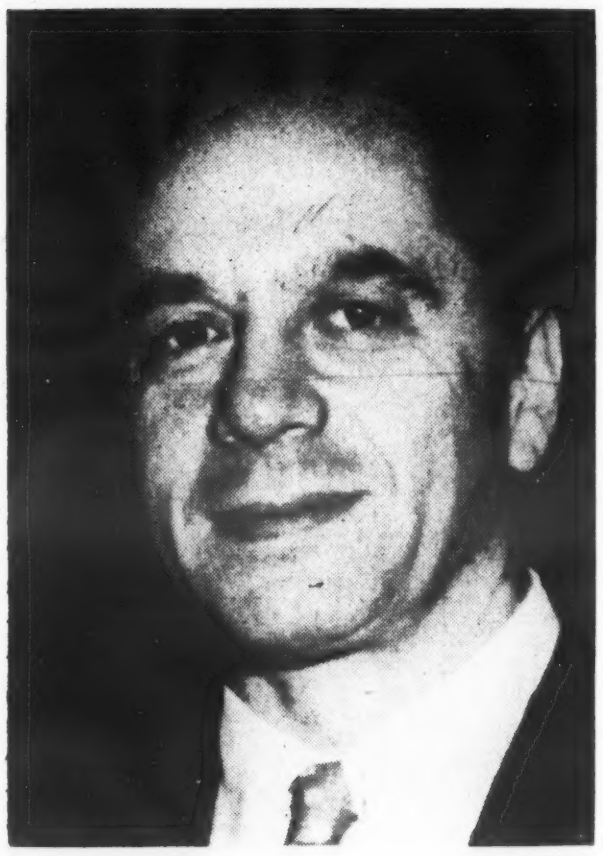
distributor of radio, electronic, and television components



NEAR THE HEART OF THE LARGEST metropolitan railroad center in the world, within a few miles of the busiest street intersection in the world, is situated one of the world's largest and busiest distributors of radio, electronic and television parts.

In Chicago, some three miles west of the famed State and Madison Street intersection, Allied Radio Corporation has its main offices and warehouse facilities. at 100 N. Western Avenue, in almost the exact geographic center of the city. There an attractive, two story building, recently constructed, and covering a square city block, lends a modern touch of architectural beauty and utility to its West Side surroundings — a dynamic symbol of the progress of a great industry. Its very appearance seems to convey the impression that here is a business that is growing, looking ahead, and preparing for whatever future years may bring. If the passer-by cares to enter the building, he will find his initial impression is corroborated as he observes a large volume operation conducted with a minimum expenditure of time and motion.

A. D. Davis, President of Allied Radio Corporation.



To understand what goes on at this hub of distribution, it is necessary to know something of the company's history, and the men who have shaped its policies.

Allied Radio originated as a wholly owned subsidiary of the Columbia Radio Corporation, a Chicago company formed in 1921 for the manufacture of radio parts, such as the variometers, varicouplers, rheostats, condensers, and coils used in the old Neutrodyne, Cockaday and other radio receivers. The parent concern later manufactured complete radio receiving sets, from crystal set on up, but as early as 1923 also entered the distribution business, as a jobber of parts for other manufacturers. It was in 1927 that Allied Radio became the subsidiary exclusively for parts distribution. When Columbia's operations were discontinued in 1930, Allied continued to operate and has since won the leading position in the distribution of electronic components.

To the observer looking for the most significant contributions to the growth of Allied Radio, two prominent factors are discernible — the growth situation in the electronic industry itself, and the company management, which has shaped policies so as to keep serving supplier and customer effectively and promptly. A plot of manufacturing and market data for the electronics industry in general parallels that representing the growth of Allied Radio. In other words, one major factor in the company's growth has been the rapid growth of a new and expanding industry. The second factor is personified in the men who have established the progressive policies and applied modern operating principles to gear Allied's distribution service to the needs of both customers and suppliers.

Among these men is A. D. Davis, the president of Allied, whose first duties with the company began in 1927. He is a dynamic, hard-working executive, with considerable mer-

chandising experience. His policies are administered through a group of senior executives who have been with the company from 18 to 30 years. Mr. Davis has simply established and enforced the basic policy that in supplying the electronic needs of customers rapidly and at the lowest possible prices, the company serves not only the best interests of its customers, but also its own best interests and those of its suppliers. Mr. Davis has also made sure that Allied's operations are constantly re-examined. The general principles and policies, well-known in low-cost merchandising circles, remain constant, while procedures are subject to change for greatest operating economy.

As it is currently operated, Allied Radio gathers over 20,000 items from more than 500 sources of supply, maintaining the largest inventory of electronic components in the world. All stocks are divided into two general classifications, forward inventory, and reserve inventory. Forward inventory consists of about a 30-day supply of every item, and all merchandise in forward inventory is considered sold. Reserve inventory comprises a two to three months' supply of all items stocked. As inroads are made on reserve inventory to replace goods shipped from forward inventory, a system of special controls informs the purchasing department when it is time to reorder each size or specification for stock. Experience has shown that the number of items that must be carried in inventory has increased at the same rate as total sales. Projection of the sales and inventory growth rates to indicate future needs, forecasts the necessity for stocking between 25,000 and 30,000 items within the next few years. With this in mind, the management has already made plans for expansion of the new building. To the present 147,000 square feet of floor space can be added an additional 130,000 square feet when needed.

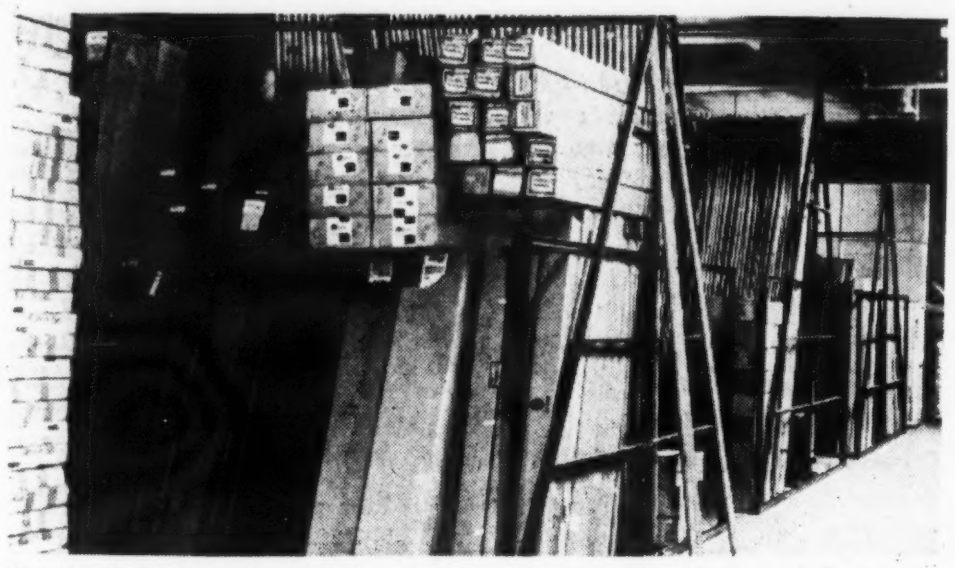
The actual process of order-filling at Allied is fascinating to watch in operation, because production-line methods are used to assemble the merchandise and move it towards its destination. Arrangement of all departments from receiving room to shipping room is designed for straight-line movement of the electronic components or units that may be called for in a single order. All materials-handling is done on the ground floor. The receiving room is at one end of the building, and the shipping room is at the opposite end. In between, an ingenious arrangement of aisles and conveyor belts serves the warehouse area in much the same way as a river and its tributaries drain a watershed.

The assembly-line technique of order filling was designed with the help of management and equipment engineers, as a precision operation comparable with plant layouts for mass production, and for the same reason of economy. Straight down the center line of the ground floor is situated the heart of the 300-foot long conveying system, a unique stack of five local and express conveyors, arranged one above the other at convenient shelf levels and totalling 1500 feet of continuously moving belts. This stack of belts, designed to serve aisles of stock on both sides, carries all but the largest items that may be called for in an order.

All of the five belts have a common source, at the stock department most distant from the shipping room. One of the express belts branches off to the wrapping room, located adjacent to the shipping room. Another express belt terminates behind the sales counter of the local salesroom, where Chicago customers come to pick up their needs. Because containers are used, in which small parts are placed and carried from one stock department to another in the order assembly operation, the fifth belt is a return conveyor, to send the containers back to the starting point.

One belt of each pair is an express conveyor, for fast movement of single item orders, while the other is a local conveyor with provision for stops at every stock department. Stock clerks fill single item orders from their department, or add the parts called for from their department to a "split order," as one is called that involves two or more stock departments. As an order moves along the proper conveyor belt, its only deviation from straight line motion is the 90 degree turn, where it branches off to the wrapping room on one side, or to the salesroom on the other. At the busiest time of day, when a stream of orders is coming off the main line, the parade of containers on the conveyor belts is an impressive sight, as everything moves to its proper destination, like bottles in a filling and packing machine.

Just as time and motion studies were used to reduce parts handling operations to a minimum, so careful planning was required to hold down the cost of office work and routing of orders in Allied's new layout. It was found preferable to perform most office functions above the warehouse floor, so a second story was designed for the required office space. A network of 7,200 feet of high speed pneumatic tubes ties office and parts-handling operations together for the transmission of orders. Some orders are received via telephone, and for these the paper work must originate in the telephone sales department. For all other orders the customer's original order form is used, going first to the indexing department. There the order has a "cap" attached, consisting of a distinctive, color-coded paper tab that shows a different color for each day of the week. This enables a sight-check at any time



On the left is a view of the floor stock area showing special bins for antennas and masts. On the right is a view of Allied's large salesrooms. Leading off the main sales area are two high fidelity equipment demonstration studios and a "Ham Shack" for amateur gear.

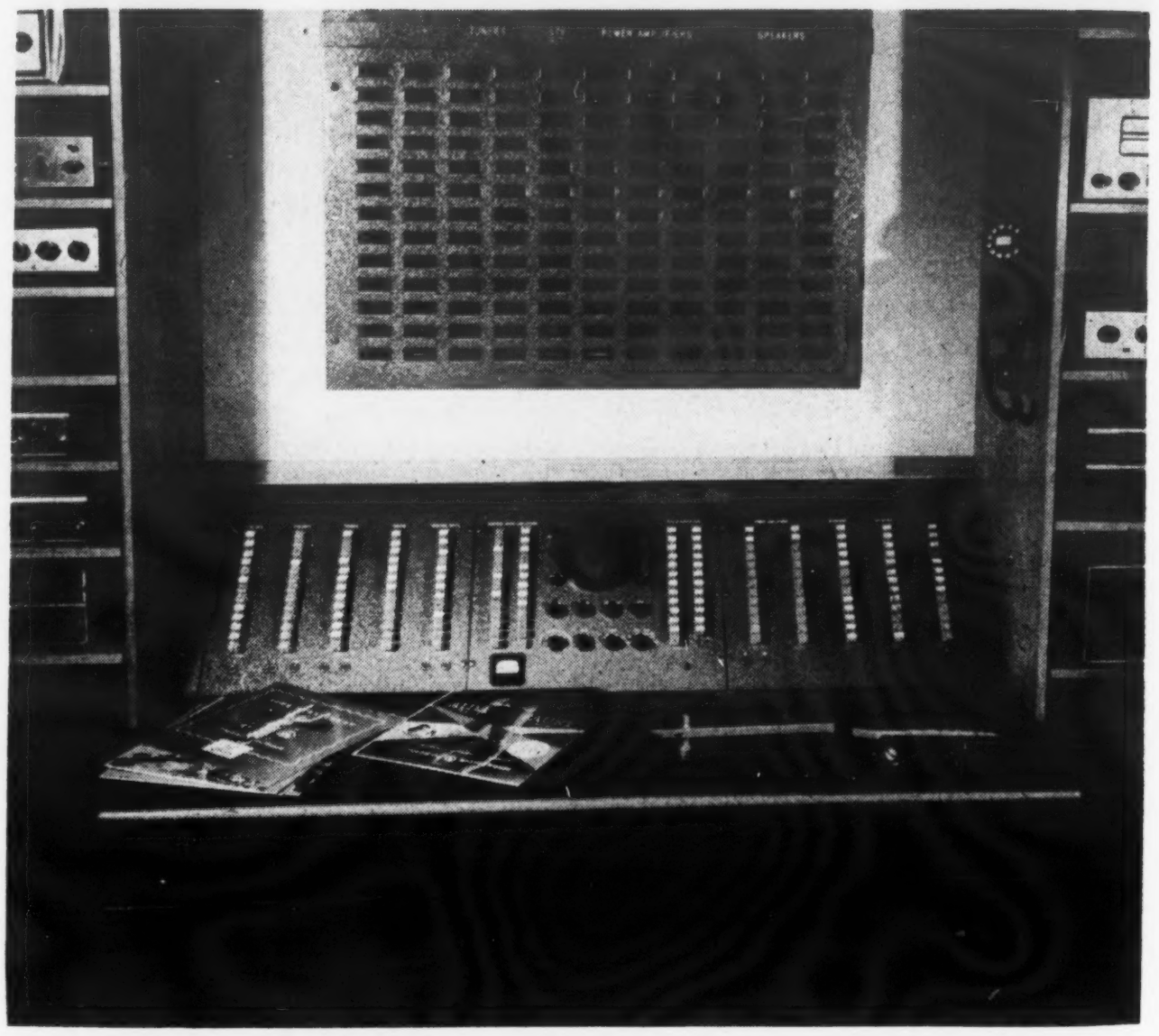
to disclose what orders have been in process more than 24 hours.

From the indexing office, where stock department designations are made, the order is tubed to the stock room point concerned, or, in the case of split orders, to the most remote stock room point involved. Order papers accompany the components as they are collected and sent down the conveyor line to the wrapping room to be readied for shipment or for the "will call" counter for local pick-up. There an analysis of the order is made to see that it has been properly filled, and to check for accounting purposes. In cases where any refund is due, it is made in negotiable form as a check, correct right down to amounts as small as one cent. The assembly-line techniques have made the routine of order filling low enough in cost to interest manufacturers in the electronics components field, who were seeking to "farm out" their small order operations.

Despite the many pressures of business at Allied, President A. D. Davis is never too preoccupied to take every opportunity for explaining the economics of distribution. He is always ready to show what an important asset a distributor is to our economy, and he has the facts and figures to prove it. He cites examples of the time and place utility added to electronic components in the company's distribution function.

Those added values of immediate delivery from a known central location are recognized by Allied's suppliers as well as regular customers, because it is not unusual for electronic parts manufacturers to change into buyers overnight, and purchase even their own products when spot delivery is important.

The distributor is able to add to a manufactured item the value of immediate delivery at minimum handling cost. A variety of small or moderate quantities of merchandise can be obtained most economically from one distributor rather than from a number of different manufacturers.



Allied's Auditioner and "scoreboard." The Auditioner selector console for demonstrating different combinations of high-fidelity components permits instant switching from one unit to another for comparative listening test.

What the economics of distribution can mean in military procurement is evidenced by Allied's experience on orders from the services. One such order called for 1400 items made by 120 different manufacturers. Had the desired quantities of each item been immediately available direct from the manufacturers, the dollar volume of the merchandise alone would have totaled about $8,500. One hundred twenty government purchase orders direct to the manufacturers would have resulted in a formidable expenditure for paper work, by both the service concerned and the companies involved. Allied was able to fill the single order immediately (for about $10,500) many thousands of dollars less than the realistic total cost of direct procurement would have been. Furthermore, the separate segments would have been only small "nuisance" orders, of no interest to a manufacturer.

• In peace or war, the miracle of modern distribution in our economy is wrought by organizations such as Allied, that can handle a variety of items made by many different manufacturers, and deliver moderate quantities at a reasonable price.

The customers served by Allied include as many different broad classifications as there are general applications of electronic components. Industrial concerns, transportation companies, and utilities on the customer list read like an American directory of blue chip concerns. Government agencies include all military services, and almost every independent department. Broadcasters and telecasters consistently place orders, as do schools and research organizations. Commercial outlets supplied are in the categories of radio specialty stores, appliance stores, depart-

Terminus of conveyor belt to shipping department. After merchandise is checked, pans are placed in bins shown at the side of packers' tables which are located on each side of the belt.

ment stores, hardware stores, and chain stores. Churches, hospitals, and movie houses, Radio Amateurs ("Hams"), Hi-Fi hobbyists, engineers, and students are others who swell the list, and account for a significant volume of business.

To satisfy the various demands of its many customers, the company offers several services other than quick delivery of electronic components. The Allied catalog of more than 20,000 items is widely known as an encyclopaedia full of information as to equipment and current prices, specifications and applications. This data, assembled at considerable cost, is distributed free to all interested users. The catalog is supplemented by quarterly additions, and by publication of the *Allied Radio Electronic News*, which has won recognition as being authoritative in its field. Informal information channels are provided by word of mouth, bringing suppliers and customers up-to-date news of the industry and market developments, via salesmen and purchasing agent contacts.

To advise on the proper application of electronic components to perform specific functions, Allied maintains a sizable technical staff of specialists, as an added customer service. Field men of broad technical experience are also available to survey proposed uses of the various items in industrial and commercial installations, and make specific recommendations.

By winning the leading position in distribution of electronic parts, Allied has become an open door for immediate nation-wide introduction of a new product. This door is open to the inventor or small manufacturer who does not have the capital to distribute and advertise the new product, as well as to the established producer who prefers to delegate the development of new product potential.

For its customers in the Chicago area, several special extra services

Five-tier conveyor belt for filling orders in Allied's stock area. Conveyor belts are: 1. salesrooms local; 2. mail order local; 3. salesrooms express; 4. mail order express; 5. return belt for empty pans.

are provided, as additions to the local salesroom. What appear to be giant "punchboards," named Visi-Dex, form a unique visible index display of actual components, accessible to those who want to check the sizes and shapes of various items briefly described in the catalog. The holes in the Visi-Dex panels provide considerable flexibility in pattern of display mounting, so that the products mounted can be changed in accordance with the amount of interest in them at any time.

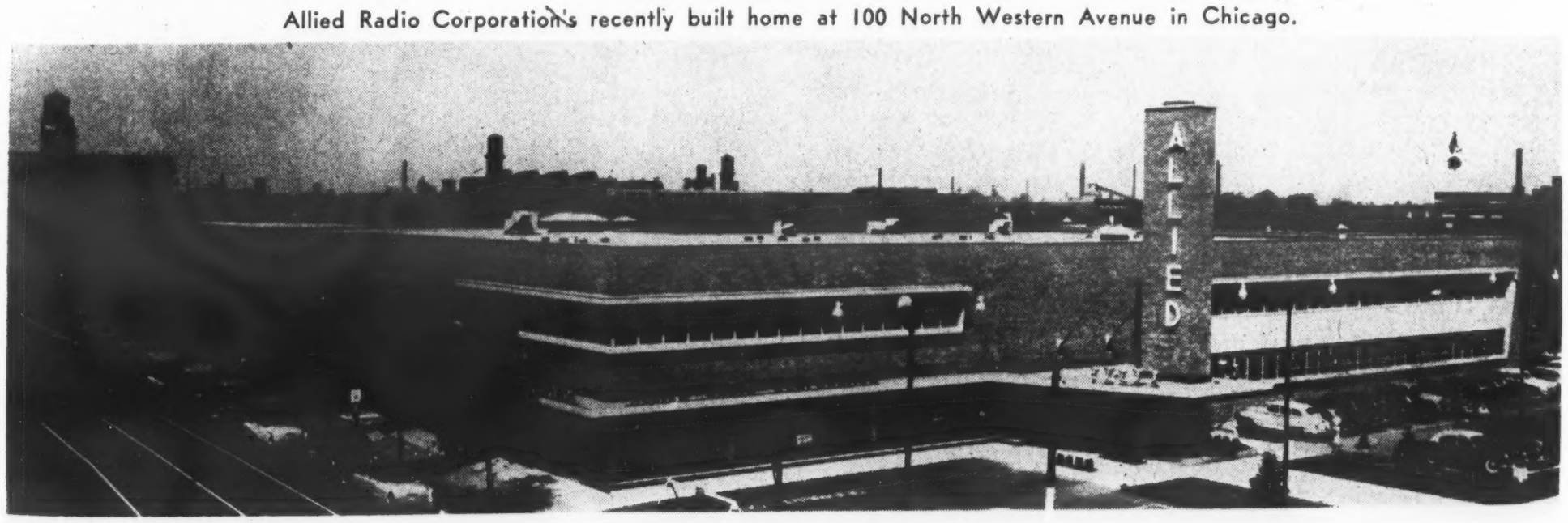
A comprehensive library of technical and trade publications is maintained for the benefit of any who visit the store.

Such hobbyist departments are also provided for Hams and Hi-Fi enthusiasts, as a Ham Shack and two Hi-Fi equipment rooms. The latter are acoustically designed chambers, each featuring a "concert organ" keyboard that selects at will any of thousands of combinations of high fidelity components, wiring them together into a complete sound reproducer, that can be auditioned by a customer, so as to select the particular items best suited to his ear and pocketbook.

All the departmental efficiency and emphasis on service to customers at Allied does not mean that human factors are neglected in the big business of distribution. On the contrary, the company is a prime example of up-to-date recognition that good customer relationships are built on good employee relationships in which human considerations are paramount. People come first at Allied.

One can not help but conclude that a distributor so well geared to the requirements of employees, customers, and suppliers may be able to stay on top for a long time in the vigorously expanding market of the electronics industry.

Allied Radio Corporation's recently built home at 100 North Western Avenue in Chicago.



Electronics in the

by Dr. Ivan A. Getting
Vice President, Research and Engineering
Raytheon Manufacturing Company

I WAS ASKED TO COVER "THE AIRPOWER FUTURE" with special reference to problems and prospects in the electronics industry." So indeed, I have three things to talk about: (1) airpower; (2) the future; and (3) the electronics industry.

Airpower, reduced to its simplest terms, is the ability of a military force to deliver by air destructive weapons on an enemy and to prevent the enemy from doing the same in reverse. As such, airpower is a lot more than airframes and engines; in fact, these are merely components in a far larger system in which the weapons, communication, navigation, and other factors play important if not at times dominating roles.

Whenever airmen meet, a toast seems always appropiate to the Wright Brothers and other pioneers of civil and military aviation. Never have I seen a toast on such occasions to the inventors of the atomic bomb—yet it is this technological advance which gives airpower its dreadful significance.

We, as a nation are now involved in a desperate arms race, a race whose righteousness none of us doubts. Till now we held our lead by virtue of a large stockpile in atomic weapons and the superior striking power of our strategic air force. In the not too distant future this preponderant advantage will disappear as Russian stockpiles and their means of delivery become sufficient to destroy our cities.

The fact that we have used only ten percent of our stockpile destroying the enemy cities while they used as much as seventy-five percent of theirs in destroying us will give us little comfort. Under these conditions, striking power will not be sufficient. Clearly the Airpower Future will have to emphasize in due proportion Air Defense against enemy attack. For if we cannot survive an airborne atomic attack ourselves the deterring force of our strategic arm will have lost its meaning. Surely we could not assume a national policy based on suicide; in short, our use of the strategic air arm as a threat to prevent the use by Russia of war as an instrument is predicated from now into the future by our ability to withstand and defeat on atomic attack by her.

Airpower in the approaching era of atomic opulence is characterized by another major consideration: our offensive and our defensive airpower must be in actual being—not in training, not in production, not in planning, and not in research. A devastating attack with atomic weapons can be accomplished in a matter of weeks or at most months. Mobilization build-up is a matter of a year or two. Much has been said about dual production facilities and facilities convertible from the manufacture of peacetime products to those of war. Obviously such planning is excellent for the second phase of a war, assuming we survive the initial impact of an atomic war. In short, first things first—we must have both a striking force and a defensive force in being to claim airpower.

Let us look a little closer at this modern airpower and compare it to the early days of military aviation. In World War I, the pilot's chief function was reconnaissance. He then embarked in a little sport, shooting at his enemy pilot with a pistol. Then he took himself more seriously and used a machine gun. But throughout the war, the pilot was essentially an errant knight.

World War II saw the emergence of significant airpower. Radar, electronic aids to navigation, and electronic communication made possible not only teamwork, but traffic control over vast areas of combat territory and the deployment of vast air armadas under dynamic conditions.

Today these concepts have grown to cover the world—electronics made this possible—and airpower has come to maturity. Today all the world is but a stage and all the airplanes merely actors under the control of a single man—the air-commander. It is this integration that makes "airpower."

What of the future—the second part of my subject? The future of airpower should be governed by the national policies enunciated by President Eisenhower: first that we shall not try to prepare for a specific date but rather build up to a continuing state of adequate readiness; and second, that we shall attain this adequacy not by outnumbering the enemy by men under arms but rather by maintaining a qualitative superiority in weapons and men.

I shall limit my remarks to the second of these two basic policies—maintenance of qualitative superiority of weapons and men. These terms are, in fact, synonymous with research and development on the one hand and training and education on the other.

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Airpower Future

In this talk delivered at the recent Air Force Association convention, Dr. Getting stresses the need for military-industry give and take in the business of defense—words that pave the way for our 8th Annual Convention.

In 1940, the total amount of money spent by the Department of Defense on contract research with industry and educational institutions was so small it would not have supported any one of the present guided missile programs. At that time, not only were the monies limited, but the Army and Navy for the most part had little appreciation for the potentialities of this type of activity and indeed were incapable of administrating such activities. There were, of course, exceptions, and some extraordinary work was done within service laboratories.

World War II brought about the creation of the National Defense Research Committee. The wisdom of our leaders of the time, and in particular of President Roosevelt, in establishing this agency gave our armed forces a real introduction to scientists and engineers. Under the enlightened policies of NDRC, these scientists and engineers made contributions which gave, as the war progressed, an ever-increasing qualitative superiority over the enemy—and the edge was the most pronounced in electronics. Night bombing of Germany and Japan, the neutralization of the buzz-bombs, the destruction of the German undersea fleets, and the annihilation of Japanese naval forces by radar-controlled gunfire, are examples of purely onesided technological victories of that era. Not to be overlooked was the intellectual heritage left by NDRC.

For the most part, all three services had learned a lesson during World War II. The emphasis on research and development after the war was all out of proportion to that of 1940. In fact, the yearly expenditures grew until last year the amount reached the staggering figure of $1½ billion, not counting other billions spent in supporting services within the departments and on various production prototypes and industrial refinement contracts.

In management of research and development contracts all the services showed remarkable progress. In fact, in certain aspects the services exhibited wisdom and statesmanship far beyond any reasonable expectation. I refer explicitly to the support of basic research in universities, non-profit organizations, and even in industry by the Office of Naval Research, and later by its counterparts in other services.

World War II was concurrent with a tremendous revolution in scientific research and its costs. Before the war, a university research man fared well with an expenditure of under $1,000 a year. After the war nuclear physicists with their large machines like cyclotrons and synchrotrons, electronic engineers with complicated tubes and elaborate test equipment, metallurgists with electron microscope and X-ray diffraction machines, all needed expensive capital equipment as well as much increased operating costs.

Privately endowed institutions and foundations were in no position to pick up the check. While Congress wrangled and accomplished nothing, the Department of Defense stepped in and provided a continuity of financial support. The American people owe to the services a debt of gratitude. Without their farsightedness, university science today would have nearly collapsed from bankruptcy; and many men and women would have been lost from these critical areas.

Today we are again facing a serious crisis in the support of basic research. Qualitative superiority in weapons is dependent on firm foundations resulting from basic research. To one actively engaged in science and creative engineering, these facts are so obvious that often one is prone to forget the situation may not be as clear to others.

Today you might question the Air Force's spending money on measuring the density of meteorites in the upper atmosphere. Actually these data are fundamental in getting information on the upper atmosphere needed in designing intercontinental ballistic rockets. And certainly, back in the late 30s, economically minded "budgeteers" would have cancelled all contracts on the measurement of slow neutrons, those strange newly discovered particles that didn't even have an electrical charge. Yet within five years these slow neutrons led to the discovery of the fission of uranium, the chain reaction, and thence the invention of the atomic bomb. With all this history to guide us, it is amazing to find in these times directives issuing from high offices forcing the services to ruthlessly shut down basic research without inquiring into the consequences in the long-term haul on our qualitative superiority in arms, or evaluating the effect of these relatively small federal savings upon the universities and other non-profit organizations. I am sure that we all welcome the appointment of Don Quarles to the newly created post of Assistant Secretary of Defense for Research so that these grave problems may receive adequate and immediate consideration.

Basic research is only the first step to qualitative weapon superiority. On it is built a community of knowledge, principles, and methods. Based on these, chemists, physicists, metallurgists, and mathematicians all contribute to the development of the fundamental bricks of electronics: tubes, resistors, transistors, inductors, magnetic materials, ceramics, etc. These are combined with electromechanical units and other elements to make receivers, transmitters, computers, storage devices. These subassemblies are parts of bombing radars, and computing sights, all-weather interceptor fire-control-systems, world-wide communication nets, blind landing and traffic control systems. It is a never ending interlocking procession—and to the first approximation, the amount of development you will get, and therefore the edge over the enemy you can expect, will be proportional to the amount of effort and money you invest.

In this business, it is still true that you get what you pay for. Science is still a boundless frontier which will attract more and more young men and women as long as we can afford it. And herein lies the dilemma—for we cannot afford not to push such science to the utmost—it is our basic material defense.

Who must bear this heavy cost—can industry and the universities? Obviously not. The economic plight of endowed universities and science foundations in the present period of inflated costs and small real incomes is well known. Neither can industry adequately support military research. It is basic to military research and development that it reach as far out as possible. It is not governed by the normal economic laws of commerical enterprises.

Dr. Ivan A. Getting

Dr. Getting's knowledge and experience in the electronics field has recently been well acknowledged by his reappointment by the Air Force to the position of Chairman of the Electronics and Communications Panel of the Scientific Advisory Board, U. S. Air Force, for 1954.

The appointment was made by General Nathan F. Twining, Chief of Staff, USAF. His letter said, ". . . Both in the solution of the complex technological problems with which we are faced, and in the recognition and exploitation of scientific opportunities which arise, the Air Force is fortunate in being able to utilize your knowledge, experience, time and effort through your work with the SAB. . . ."

Competive costs and consumer reaction play a minor role. The dominating force is technical achievement —or, as we call it, qualitative superiority. Therefore, military research calls on extreme techniques: high power, accuracy, light weight, extreme speed, and high reliability. The extent of these extremes is determined by the amount of effort—and the responsibility rests squarely with our government. To be sure there is a tremendous by-product to military research and development; for from it, in time, flow some commerical products and scientific achievements.

This brings me to my third task; the problems and prospects of the electronics industry in future airpower. The electronics industry has a dual character: it is a major element of our peacetime economy, and it is a vital element of our military potential. The relations between the two roles are sometimes subtle and at other times basic. There can be no doubt that the large amount of military-sponsored research during the war on radar gave a strong impetus to television, But beyond this, the exposure of a large number of young men to electronics in the services, with the training these men received, made it possible for this country to have the large numbers of television service men for our peacetime economy. In reverse our large television industry with its tremendous service establishment and hundreds of TV schools provides a pool of highly trained men for a war emergency. In short, the industry as such has a definite dual role.

Recently the Air Force announced a new policy for "Weapon Systems Development" in which one contractor, presumably the airframe manufacturer, is to be given the contractual responsbility for the development of a complete airplane with all its elements. By this means the Air Force is attempting to obtain integrated, combat-ready weapon systems. It is in part a recognition of the intimate relationship of the elements that go into a fighting aircraft; but it is also a recognition of the administrative problems which existed when the Air Force itself tried to provide the technical and contractual coordination.

It is not at all clear that swinging all the way in the new approach of contracted systems responsibility will either solve these problems, nor is it clear that new ones will not rise to rear their ugly heads. Over the long run there are a number of dangers. One of these is the possibility of severance of the intimate intellectual relationship which now exists between the Air Force and the electronics industry. This relationship has been mutually stimulating, and will undoubtedly be reduced by the insulation of dealing through prime contractors. Another possible danger is the growth within the airframe industry of specialized electronic facilities, lacking the advantages of stabilizing peacetime and commerical support.

Granting that military expenditures are bound to fluctuate, such facilities become in effect expensive and detract from the concept of dual facility plants which Mr. Wilson advocates. Finally, there is always the danger, and it is particularly evident right at this time, that projects not directly associated with end-item objectives will be cancelled.

It is inevitable and proper that prime contractors under the weapon systems concept take the short-time view. They are required to produce an integrated machine in a finite time. Consequently they must start with available building blocks. This incentive toward conservatism will reduce waste but perhaps at the cost of advanced performance. Thus, over the long haul we shall stand to suffer in qualitative superiority, and unless effective steps are taken to continue direct contracting between the Air Force and the electronics industry not only on new components, and techniques, but also for major elements like fire-control systems, auto pilots, and automatic landing systems. It is interesting to note that to date every successful anti-aircraft guided missile, whether ground-to-air or air-to-air, was developed with systems responsibility in an electronics organization.

I sincerely hope that the Air Force will approach their new weapons system contractual policy with care, and that the Air Research and Development Command will continue along the lines of relaxing on channels of communications between contractors and the using branches of the Air Force, provide for better coordination, streamline their contractual procedures, and above all zealously guard the long-term projects and their research programs, and support component developments.

(Continued on page 78, col. 2)

8th Annual Convention

MAY 6th 7th 8th

WASHINGTON

Photo by Frank Smith

SHOREHAM HOTEL

Communications and Electronics in Continental Defense

Capitol of the Free World – Heart of

The AFCA, recognizing the importance of industry's place in assisting the Federal government in the formulation and activation of continental defense policies, has chosen Washington as the location for its 1954 Convention. The program has been built around the theme—"Communications and Electronics in Continental Defense."

The entire facilities of the West Lounge and Main Ballroom of the Hotel Shoreham have been secured for our meetings and accommodations. This enables us to conduct all our activities, including banquets and display of exhibits, within an easily accessible and concentrated area.

The Exhibits Committee promises a show which will interest everyone attending the Convention. Both indoor and outdoor exhibits are planned and will be provided by the Army, Navy, Air Force, Marine Corps and Federal Civil Defense Administration. Ample space for the exhibits has been obtained in the convention area of the hotel and on the grounds of the Naval Ordnance Laboratory. All of the military services are enthusiastically planning their displays which will range from small components to complete operating equipments. The variety of the equipments to be shown guarantees an exhibit *you* cannot afford to miss.

Schedule of Activities

Thursday, May 6

Chapter Presidents Meeting	9:30 A.M.
Keynote Luncheon	12:30 P.M.
Defense Symposium	2:30 P.M.
Cocktail Party—Industry Sponsored	6:30 P.M.
Buffet and Get-Together	7:30 P.M.

Friday, May 7

Board of Directors and National Council Meeting	9:30 A.M.
Tour of Naval Ordnance Laboratory (Luncheon at N.O.L.)	10:00 A.M.*
Cocktail Party—Industry Sponsored	6:30 P.M.
8th Annual AFCA Banquet	7:30 P.M.

Saturday, May 8

Directors and Executive Committee Breakfast Meeting ..... 9:00 A.M.
Post convention, sightseeing, etc. activities for the membership.

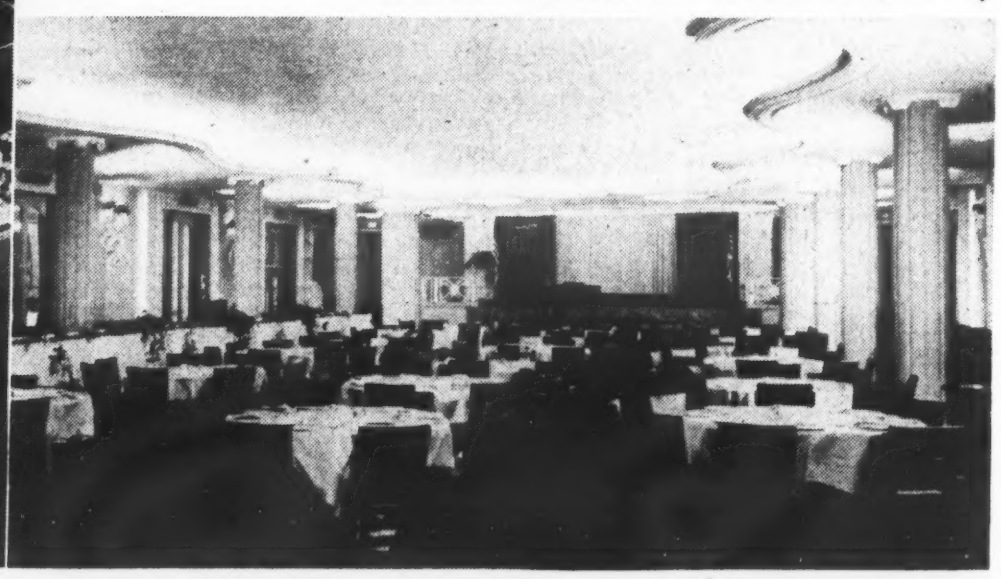
*Special busses will be held for the Council and Board of Directors members to take them to N.O.L. after their meeting. All busses will return from N.O.L. in the afternoon in time for the Convention's evening program.

Fees

The overall fee for the entire convention program is $20.50. For the information of those who may wish to attend only a part of the convention, or those who wish to bring guests to certain events, the following breakdown of the costs is given: Keynote Luncheon and Symposium, $3.00; Buffet and Get-Together, $6.00; Naval Ordnance Laboratory Tour, including luncheon, $1.50 (reservations for tour must be made by April 28); Banquet, $10.00.

An aerial view of the Hotel Shoreham, headquarters for the 8th Annual AFCA Convention. ←

The Terrace Banquet Room will be the scene of the Keynote Luncheon, Buffet and Get-Together, and Annual Banquet. ↓



of the Defense of the West

ATTEND . . .

- ***Keynote Luncheon and Annual Banquet***

The keynote luncheon will define the objectives of the convention's theme—"Communications and Electronics in Continental Defense." The principal speaker will be the Honorable Val Peterson, Administrator of the Federal Civil Defense Administration.

At the 8th Annual Banquet, an outstanding national figure, to be announced at a later date, will conclude the convention's program with a message to the members concerning our participation in the nation's defense program.

- ***Continental Defense Symposium***

This intensely interesting discussion of the convention's theme will give a convincing picture of the entire military and civil defense program. Participants in the symposium are the best equipped in their fields to guide our study of the subject. The keynote luncheon speaker, the Honorable Val Peterson, will preside at the panel and offer the program of FCDA. Other speakers on the program include: the Honorable Arthur S. Flemming, Director of the Office of Defense Mobilization; the Commanding General of the Air Defense Command, USAF, and Mr. Frederick R. Lack, Vice President of the Western Electric Company. You can't afford to miss such authorities, representatives of the government, the military and industry, speaking on this most vital topic.

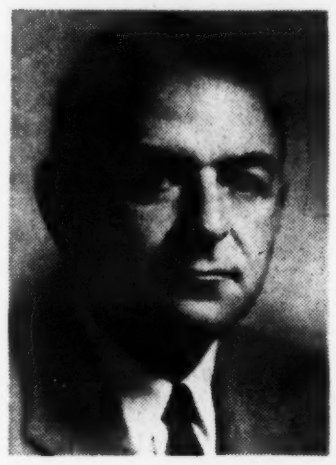
- ***Naval Ordnance Laboratory Tour***

A full day has been devoted to a tour of this important military establishment by the members of our association. As complete an inspection as military security will allow has been mapped out by the Laboratory personnel. Testing equipment, wind tunnels, electronics laboratories, and many other items of special interest will be viewed by the members. Not enough emphasis can be placed on the value of this tour—a chance to see government research and development in action—a special privilege for AFCA members.

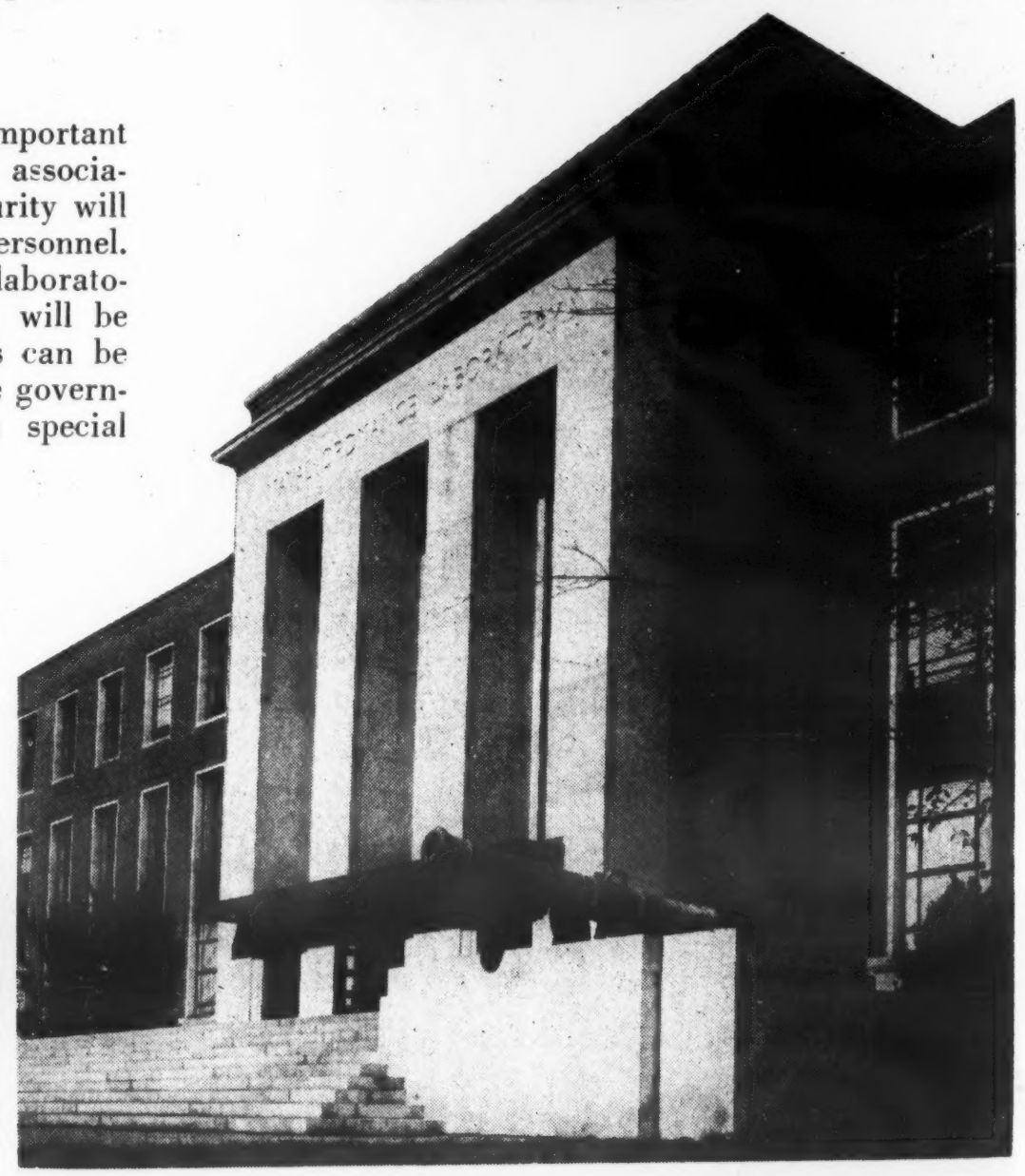
Featured Speakers

The Honorable
Val Peterson
Federal Civil Defense
Administrator

The Honorable
Arthur S. Flemming
Director, Office of
Defense Mobilization



Frederick R. Lack
Vice President, Western
Electric Co.
Past President, AFCA

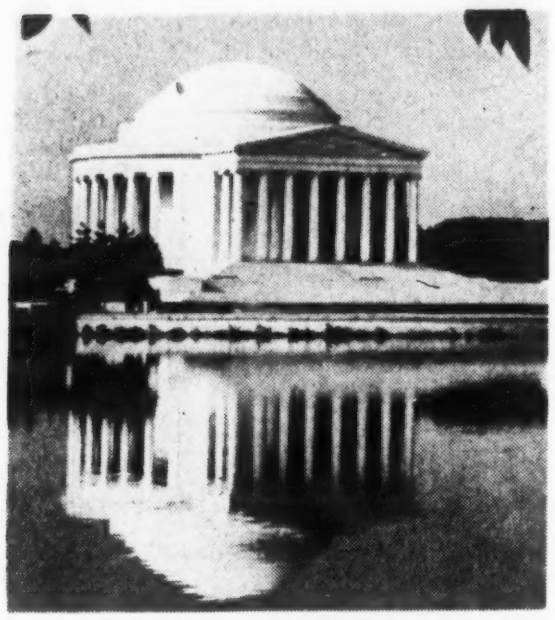


Views of the Naval Ordnance Laboratory show the entrance to the main building (right) and the wind tunnel building (below) with its 52 foot vacuum sphere extending through the roof. All the military services will have heavy equipment exhibits, not able to be displayed at the hotel, located on the grounds of NOL for view.

More Convention Plans

- ***Cocktail Party***

  Group member representatives in Washington will sponsor two gala cocktail parties during the Convention. One affair will be held before the Buffet and Get-Together on Thursday evening and the other industry-sponsored party will precede the Annual Banquet on Friday night.



Thomas Jefferson Memorial
Washington, D. C.

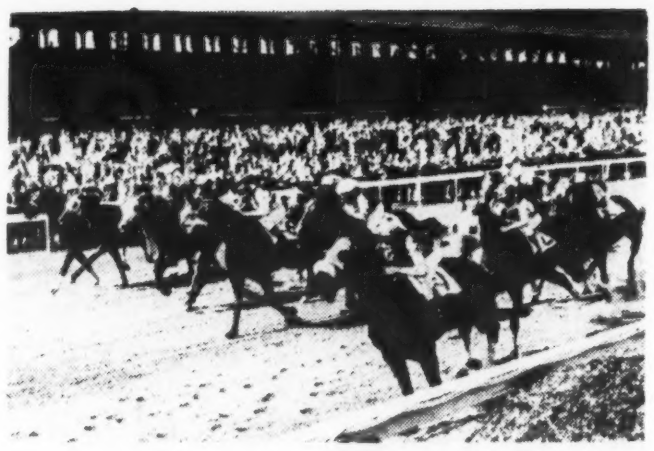
- ***The Ladies (God Bless 'Em)***

  We are, of course, expecting the distaff side to attend the luncheon, symposium and buffet supper on May 6th and the banquet on May 7th. While the gentlemen are being shown the wonders of the Naval Ordnance Laboratory on Friday, Mrs. Joseph R. Redman, wife of our national president, has arranged an interesting schedule. This will include a dutch-treat luncheon and tours in Washington and Mount Vernon.

Mount Vernon
Home of George Washington

- ***Post Convention Weekend Plans***

  Pimlico, America's most famous race track, will open its Spring Season on May 7th and, through the Maryland Jockey Club, has provided complimentary tickets for admission to the track on Saturday, May 8th. Watch the electronic camera snap your winner in action! Many other holiday activities, including sightseeing, the theater, civic shows, will be available for your vacation pleasure and entertainment.



You have already received your preliminary notice of the Convention Program. Return this promptly so that hotel reservation and final registration information can be sent to you immediately. Make your reservation NOW for the

Important 8th ANNUAL AFCA CONVENTION.

From the President

President Redman extols the attractiveness of Washington in the Spring, and urges AFCA members to attend the 8th Annual Convention of the association.

Spring is just around the corner, and Spring fever makes one look forward to a vacation. Now is the time to begin planning.

What better reason for a vacation than to combine business with pleasure and attend the 8th Annual Convention of the AFCA to be held in Washington the 6th, 7th and 8th of May.

The Washington Chapter will be your host. The convention committee is busily formulating plans to make this convention the most instructive and interesting one ever held. All they will need to make it an accomplished fact is YOUR cooperative attendance.

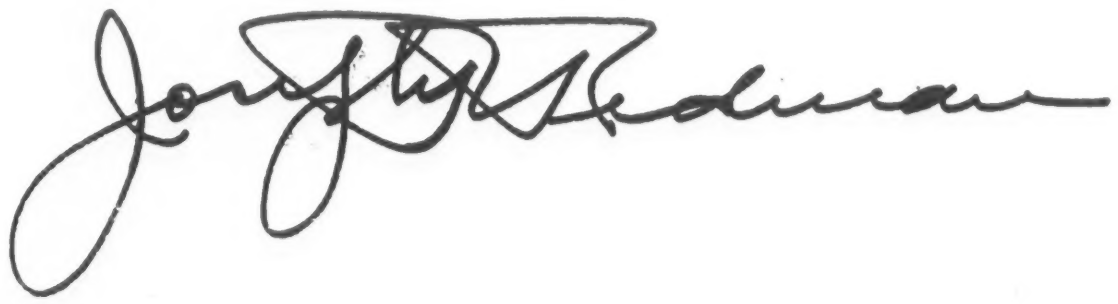
Now a few words about the locale of this convention. No city in the world is more beautiful than Washington, your Nation's capital. Thousands of excursionists visit Washington in the Spring to see the famous cherry blossoms in bloom, and while our convention is a little late for these, young foliage will be at its height.

There is much to see at this seat of the U. S. Government and the ladies in particular will want to see the stately public buildings, historic sites, and monuments. Interesting museums and galleries are included in the tours planned for the wives of the members. Nearby is Mount Vernon, the home of George Washington. Not far away is Annapolis, the capital of Maryland — quaint historical city and the site of the U. S. Naval Academy. A Flower Mart and garden tours are also scheduled for that week in the area.

Washington today is the center of the diplomatic world. Government officials, business representatives, and international leaders make their headquarters here.

You are urged to attend this convention, bring your family and spend the weekend following the convention in sight seeing, including the races at Pimlico, if you like.

This convention is your chance of a lifetime.



Association Affairs

Colonel Larew Heads Army Communications Service Division

Colonel Walter B. Larew has been appointed Chief of Army Communications Service Division, Office of the Chief Signal Officer.

He replaces Colonel William D. Hamlin, who has been named Army representative to the Directorate of Communications in the Office of Transportation and Communications, Department of Defense.

Colonel Larew comes to his new post from Korea, where he was Signal Officer, Korean Communications Zone.

ADMIRAL FURTH BECOMES CHIEF OF NAVAL RESEARCH

Rear Admiral Frederick R. Furth, USN, recently took office as the new Chief, Office of Naval Research, succeeding Rear Admiral Calvin M. Bolster, who has retired.

Admiral Furth has had a long career in Naval Communications. In World War II he served in the Office of the Chief of Naval Operations, durwhich time he was one of the two Navy members of the U. S. Radar Mission to the United Kingdom. While performing duties in the Office of Naval Operations, from 1940 to 1945, he was cited for "displaying initiative and insight into scientific and technical matters in connection with the development, installation and operational use of radio, radar, sonar and other electronic equipment. . ."

Radio Receptor Co. President, Ludwig Arnson, is shown with Brig. Gen. Wesley C. Guest (l) of Ft. Monmouth and William McGonigle (r), President, Veterans Wireless Operators Assn. after the association presented Mr. Arnson a medal commemorating the 50th anniversary of his sending, on Dec. 7, 1903, the first CDQ (SOS) wireless distress call from an American ship.

SERVICE PERSONNEL NAMED TO OFFICE OF TRANSPORATATION, COMMUNICATIONS

Three high-ranking officers of the Army, Navy and Air Force have been named as specialists representing their respective branches on the staff of the recently-created Communications Division of the Defense Department's Office of Transportation and Communications.

Colonel William Hamlin, SigC, whose most recent post has been Chief, Army Communications Service Division, has long been concerned with military communications.

Captain Gifford Grange, USN, Administrative Assistant in the Security Branch of the Directorate of Naval Communications, represents the Navy in the new divison.

Colonel Sterling Briggs, USAF, was formery Chief of the Program and Standards Branch of the Air Force Directorate of Communications. It has been announced that Lt. Col. M. E. Niccolini, a Contributing Editor of SIGNAL, will succeed Colonel Briggs.

Two of those appointed to the OTC, Colonel Hamlin and Colonel Briggs, are members of the AFCA.

At the Pentagon, in the Office of the Secretary of the Navy, Robert B. Anderson, Captain Frederick Raymond Furth, USN, is sworn in as Chief of Naval Research with the rank of Rear Admiral. Rear Admiral Ira H. Nunn, USN (left) Judge Advocate General, administers the oath of office as Under Secretary of the Navy, Thomas S. Gates, Jr. (right) looks on.

SIGNAL Associate Editor Receives IRE Award

Dr. Harold A. Zahl, Director of Research for the Signal Corps Engineering Laboratories at Fort Monmouth, New Jersey, and Associate Editor of SIGNAL, has been named the recipient of the Institute of Radio Engineer's Harry Diamond Memorial Award for 1954. His citation reads, "For his technical contributions, his long service, and his leadership in the U. S. Army Signal Corps research program." This award is given annually to persons in government service for outstanding contributions in the field of electronic research.

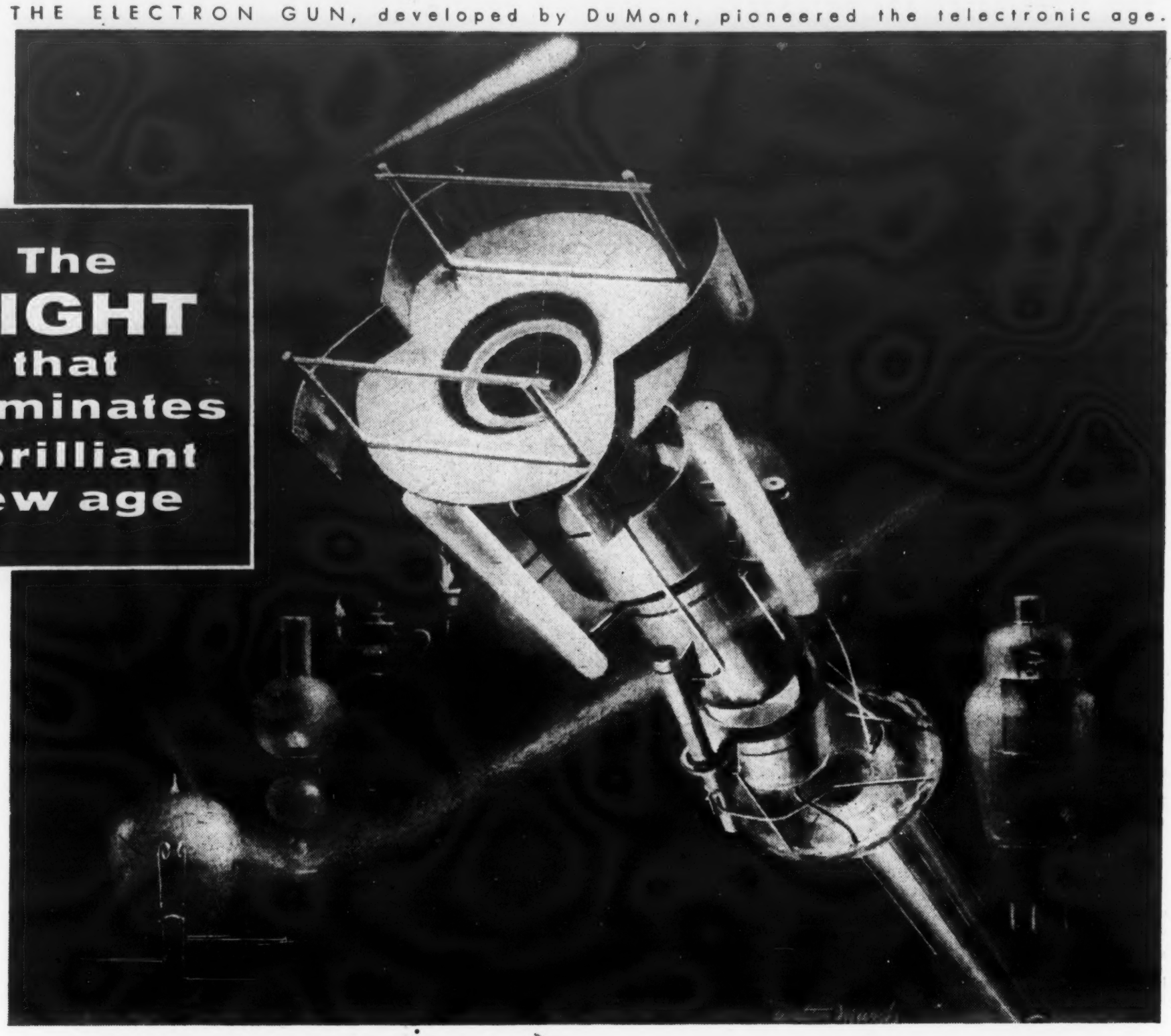
The award will be presented at the Institute's annual banquet at the Waldorf Astoria Hotel in New York City, on March 24, 1954 during the IRE National Convention.

Tollaksen Takes Post With Remler Company Ltd.

Remler Company Ltd. of San Francisco, an electronics manufacturer, has recently announced the appointment of Leslie B. Tollaksen as manager of technical products with offices located in Washington, D. C.

Formerly with Sperry Gyroscope Co., Mr. Tollaksen has also been with the government and industrial division of the Philco Corp. in Washington where he is Membership Chairman of the AFCA Washington Chapter.

THE ELECTRON GUN, developed by DuMont, pioneered the telectronic age.



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INSTRUMENT DIVISION — Cathode-ray oscillographs, electronic instruments.

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AFCA Group Members

Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

Acme Telectronix
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Air Marine Motors, Inc.
Allied Control Co., Inc.
Allied Radio Corporation
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American Cable & Radio Corp.
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Barry Corporation, The
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Berkshire Transformer Corp.
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California Water & Telephone Co.
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Capitol Radio Engineering Inst., Inc.
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Columbus Process Co., Inc.
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Downing Crystal Company
Dukane Corporation
DuMont, Allen B., Laboratories, Inc.
Eastern Air Devices, Inc.
Eastman Kodak Company
Electronic Associates, Inc.
Elgin Metalformers Corporation
Espey Manufacturing Co., Inc.
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Federal Telephone & Radio Corp.
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Globe Wireless, Ltd.
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Hazeltine Electronics Corp.
Heinemann Electric Company
Hercules Motor Corp.
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Hughes Aircraft Company
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Institute of Radio Engineers
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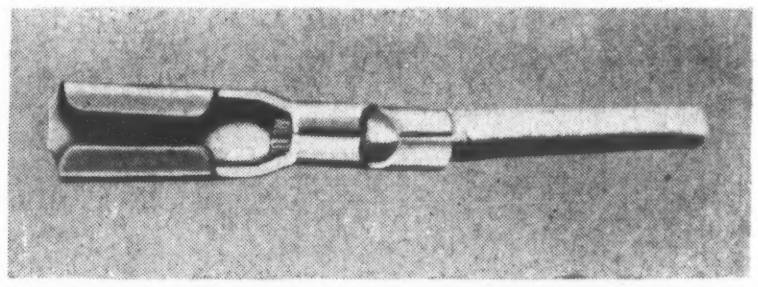

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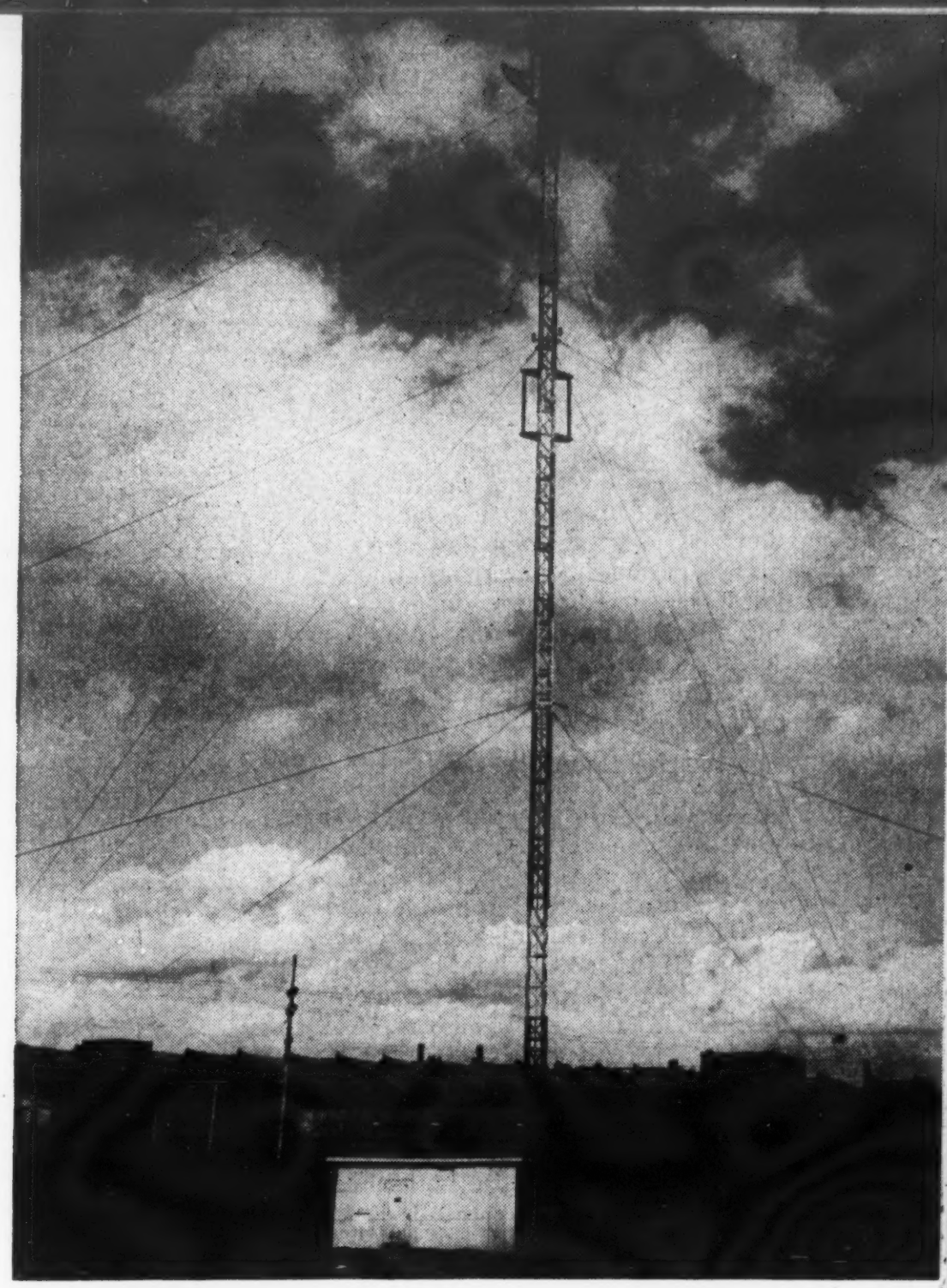
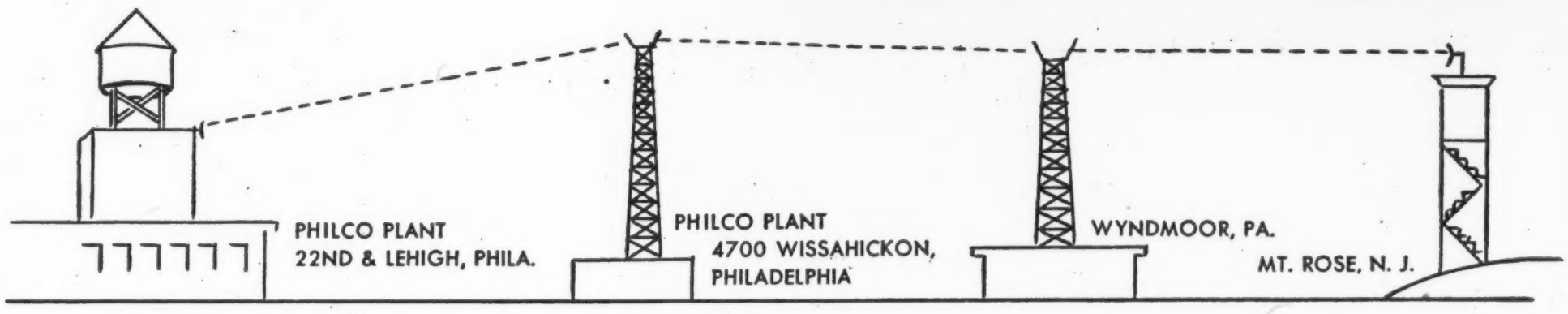


Philco 160-foot microwave tower at 4700 Wissahickon . . . one of four similar Philco test sites in the Philadelphia area.



To supply industry's mounting demand for modern, efficient and private communications which do not depend on vulnerable wire lines, Philco is installing thousands of miles of new microwave for oil and gas pipelines, utilities, railroads and other major industries. Constantly improving the performance and reliability of Philco microwave equipment, each newly designed component and equipment is field tested and perfected on Philco's experimental microwave system . . . the equivalent of a 70-mile commercial installation . . . Another reason why Philco Microwave leads the field in quality, performance and reliability . . . Good reason why Philco is the world's leading manufacturer of microwave equipment.

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Chapter News

1953 Chapter of the Year—Augusta - Camp Gordon

Augusta - Camp Gordon

A gala dinner-meeting at the Bon Air Hotel on December 11th concluded chapter activities for 1953 and ushered in the new year with the installation of the recently elected chapter officers.

Col. Fred Elser, outgoing chapter president, reviewed the chapter's achievements during the year and expressed his personal thanks to his fellow officers for their support and cooperation during his administration. He also expressed appreciation for the support of personnel at the Camp Gordon Signal School, Georgia Power Company, Western Union Telegraph Company and Southern Bell Telephone and Telegraph and their contributions to the past year's success. Voicing his confidence in the 1954 officers, Col. Elser then turned the chair over to W. O. McDowell, Augusta district manager of Southern Bell, the new president.

President McDowell congratulated the outgoing officers on the progress during 1953, and urged the chapter membership to foster and maintain a team spirit as an essential in meeting 1954 goals and in accomplishing those objectives for which the AFCA was formed. He then presented the entire slate of new officers (listed in Jan.-Feb. SIGNAL). He also expressed the chapter's regret at the imminent transfer overseas of Col. Elser and Lt. Col. H. C. Williams, outgoing chapter secretary.

Brig. Gen. T. J. Tully, new honorary president of the chapter, also commended the previous administration and pledged his personal support to the chapter in its 1954 activities.

The following appointments were made at the January 28th meeting:

Membership committee—Col. Harold A. Buck, chairman, Col. Arthur A. McCrary, G. M. Sweeney, H. A. Fleming, Col. George Lennox, Col. Wilbert A. Speir.

Program committee: first quarter—John Owen, chairman, Lt. Col. Bertie L. Avera, F. A. Saxon; second quarter—Lt. Col. Bertie L. Avera, chairman, F. A. Saxon, Col. Clinton W. Janes; third quarter—F. A. Saxon, chairman, Col. Clinton W. Janes, Jewett M. Harris; fourth quarter—Col. Clinton W. Janes, chairman, Jewett M. Harris, Col. Wilbert A. Speir.

House committee—Maj. Melvin L. Maxon, chairman, J. W. Owen, Lt. Col. John H. Cashion and Col. George Lennox.

James M. Williams of Southern Bell was elected chapter secretary to succeed William Reiser who had been transferred to Atlanta.

Following a general discussion of the various phases of chapter activity, each committee was directed to hold its own meeting within the next ten days to consider the problems referred to it.

Baltimore

The "Fiftieth Anniversary of Powered Flight" was celebrated by the Baltimore Chapter on December 10th. Most appropriately, the host for the occasion was the Glenn L. Martin Company.

The two hundred members and guests were welcomed by W. W. Bender, Manager of the Electronics Department, following dinner in the company cafeteria. An introductory talk by Edward G. Uhl, Vice President of Engineering, was followed by a movie which gave the audience an excellent briefing on Glenn L. Martin products and electronic facilities.

A tour of the production line, which included the P5M Marlins, the Air Force B-57 and the Matador guided missile, was the highlight of the evening. Company guides conducted groups of ten and answered questions within the limits of security regulations.

Arrangements for the excellent program were made by A. W. Perkins of the Glenn L. Martin Company.

The January 19th meeting was held at the Air Arm Division of Westinghouse Electric Corporation at Friendship Airport.

Chapter President George Ruehl introduced B. M. Brown, Manager of the Air Arm Division, who gave a thumb nail description of the plant and facilities. Other Westinghouse officials were then introduced as follows: F. W. Godsey, Jr., Manager of the Baltimore Divisions; W. E. Benoit, Manager of the Electronics Division; R. K. McDevitt, Manager of Manufacturing; Dr. S. W. Herwald, Manager of Engineering; G. T. Ringe, Manager of Application Engineering; and K. H. Keller, Assistant to the Divisions Manager.

Guides were provided for groups of ten who inspected the manufacturing facilities and the hangar with its complement of military jets and propeller type aircraft, also the "Flying Laboratory" and the target plane. The tour then proceeded to the Environmental Laboratory where great interest was shown in the performance of the Reeves Analog Computer in actual operation, in conjunction with an Automatic Pilot and a mockup of a military plane.

Boston

"Electronics on the Home Front" was the subject of an address by Harold F. Bersche, Manager, distributor sales, RCA Tube Department, at the November 19th meeting of the Boston Chapter.

Mr. Bersche discussed the future of the electronics industry, pointing out the growing new fields of color television, industrial television, electronic perpetual inventory machines, headlight beam control, transistors, microwave relay, etc. He supplied many interesting and surprising statistics, such as the fact that there are 1,300,000 more electronic tubes in use in the U. S. than the number of light bulbs.

Partial view of the Baltimore Chapter dinner-meeting at the Air Arm Division of Westinghouse Electric Corporation, Friendship Airport. A guided tour of the plant and facilities was the highlight of the evening.

Boston's January meeting was addressed by Brig. Gen. George W. Goddard, USAF (Ret.). L to R: B. K. Thorogood, vice-president; Mac R. Bougere, program chairman; Gen. Goddard; Raymond B. Meader, chapter president.

and estimated that 42,000,000 transistors would be used in original equipment in 1956.

The dinner meeting was held at the Officers Club of the Naval Receiving Station in South Boston, with 100 members and guests present.

Brig. General George W. Goddard, USAF (ret.), former Air Force photography expert, discussed military photography at the chapter's January 21st meeting. General Goddard, who was for many years Chief of the Photographic Laboratory at Wright Field and, prior to his retirement, was Director of Reconnaissance for NATO, is now with the Bulova Research and Development Laboratories, Inc.

In addition to three-dimensional color pictures taken from jet aircraft over Europe, Korea, Japan and the U. S., General Goddard showed strip maps made over the United States. He also described cameras of 22-24 feet focal length, continuous strip film packs and high-speed, light-weight cameras.

Chicago

"The Military and Communication Applications of Transistors" were discussed by Wilson T. Rea, Director of Military Communication Development at Bell Telephone Laboratories, New York, at the January 28th meeting of the chapter.

Mr. Rea, who has been engaged in development and research problems since 1926, was introduced by O. G. Smith, Chief Engineer of the Illinois Bell Telephone Company, the host organization for the meeting.

With the increasing use of the transistor in communication and electronic equipments, Mr. Rea's talk, which was illustrated by slides and demonstration equipment, was of great interest to the audience.

The meeting was held at the Swedish Club of Chicago and was preceded by a social hour and dinner.

Dayton-Wright

The "Impact of Electronics on Aviation" was the subject of a discussion conducted by the Dayton-Wright Chapter at its January 26th meeting at the Dayton Biltmore Hotel.

The speakers were: John E. Keto, Technical Director, Wright Air Development Center, Air Research and Development Command; T. H. McNary, Chief, Electrical Section, Technical Staff, Boeing Airplane Co., Wichita, Kansas; and H. R. Oldfield, Jr., Manager, Plans and Product Applications Laboratories, Electronics Division, General Electric Co., Syracuse, N. Y.

Decatur

New chapter officers for 1954 were elected at the December 17th meeting as follows: president — Col. Frank J. Schaal; 1st vice-president—Henry E. Malone; 2nd vice-president — Herbert L. Senger; secretary-treasurer — David W. Richardson. New members of the board of directors are: Chester B. Badgett, David E. Beneze and Gilbert W. Slifer.

Following the business meeting, the members adjourned to the U. S. Naval Training Station on Lake Shore Drive, Decatur, for a guided tour and lecture on station operation.

Detroit

Argus Camera, Inc., one of the world's largest manufacturers of 35mm cameras and the first company to put out an all-American made candid camera for popular use, was host to the Greater Detroit Chapter on December 17th.

During a conducted tour of the Ann Arbor plant, the chapter members and guests watched the assembly of a camera which takes hundreds of parts, some so small that they have to be handled with tweezers. They were particularly impressed with the skill and precision required in this operation.

They also visited the optical laboratory, completely humidity controlled and one of the most modern types of its kind in the world, where they observed the processing of a rough piece of glass through grinding, polishing, centering and coating by the use of magnesium fluoride which speeds the light through the glass and prevents glare. After the lens is processed, cleaned, and tested it is assembled into commercial cameras and projectors and into government products.

Arrangements for the interesting evening were made by James Brinkerhoff, Factory Manager of Argus Camera.

"Radar Probes the Weather" was the subject of Fort Monmouth's December meeting. Shown below (l to r): Col. Loren E. Gaither, membership chairman; Prof. Alan C. Bemis of M.I.T., guest speaker; and Col. Paul Langguth, new chapter president.

Newly elected officers of the Far East Chapter (l to r): Capt. Lester D. Fowler, secretary; Preston Shivers, 2nd vice-president; Capt. Francois C. B. Jordan, 1st vice-president; Brig. Gen. Elton F. Hammond, president; Col. Gus B. Hoffman, 3rd vice-president; and Capt. Lawrence E. Echelmeyer, treasurer.

The chapter's January 21st meeting was held at the Naval Air Station, Grosse Ile, with Capt. M. T. Martin, Commanding Officer, and Lt. E. Norris, Communications Officer, as hosts.

The AFCA group was given an introduction to reserve training, saw a film, "Fighter Direction Principles of Interception," and toured the CIC training facilities and the aviation technicians' training facilities. In addition, various pieces of electronic equipment were explained and demonstrated.

Chapter President Leo J. Ritter was recently transferred to Cleveland. Vice-President L. E. Zumsteg, superintendent of Western Union Telegraph Co., is acting as president until the chapter elections in the spring.

Far East

The new officers of the Far East Chapter, elected at the reorganization meeting in December, are as follows: president — Brig. Gen. Elton F. Hammond, Signal Officer, HQ, AFFE; first vice-president — Capt. Francois C. B. Jordan, N-5, COMNAVFE; second vice-president — Preston Shivers, Philco manager, Pacific operations; third vice-president — Col. Gus B. Hoffman, Director of Communications, HQ, FEAF; secretary—Capt. Lester D. Fowler, Signal Section HQ, AFFE; treasurer — Capt. Lawrence E. Echelmeyer, 1808th AACS Wing.

The meeting was held in the Union Club of Tokyo and was presided over by Col. Wesley E. Calkins, USAF, who had been acting as president of the chapter until its reorganization.

Fort Monmouth

Col. Paul O. Langguth, deputy commander of the Signal Corps Engineering Laboratories, was elected president of the Fort Monmouth Chapter at its December 10th meeting.

The other new officers are: first vice-president — Rear Adm. Andrew G. Shepard, USN (ret.); second vice-president — Col. Sidney S. Davis, chief, Signal Corps Publications Agency; secretary — Felix Celli, SCEL. Miss Esther M. Ferneau was reelected treasurer. New members of the board of directors are: Col. Cary J. King, William Christopher, Lt. Col. Reuben Abramowitz, Lt. Col. Ollie J. Allen and John J. Slattery. Col. Joseph Heinrich, retiring chapter president, becomes a board member. Directors continuing in office are: Col. Loren E. Gaither, Col. John W. Atwood, Edward F. Kolar, Dr. Edward G. Witting, Arthur L. Adamson, and Norman J. Schwartz.

Guest speaker for the evening was Professor Alan C. Bemis, faculty member of the Massachusetts Institute of Technology and supervisor of the Weather Radar Research project sponsored by the Signal Corps. His topic was "Radar Probes the Weather."

Professor Bemis stated that much research and development remains to be accomplished, but declared that radar can presently locate and track isolated storms, such as thunderstorms and tornadoes, with great precision and dependability; measure rainfall over a large area more accurately than scattered rain gauges; and contribute almost as the airplane to studies in cloud and precipitation physics.

He pointed out that radar can "see" as high in the atmosphere as snow crystals are found, but that the earth's curvature and the power requirements for radar equipment usually limit the horizontal range to one or two hundred miles.

"It is unreasonable then, to expect it to improve the general accuracy of 24-hour forecasting," said Professor Bemis, "but, given a forecast for the development of a particular storm situation, radar should aid the forecaster enormously in his estimate of the exact amount, type and location of precipitation, and improve the detail of his airways forecast."

The dinner-meeting was held at Gibbs Hall, with 270 members and guests in attendance.

At its January 21st meeting, the chapter heard the director of the Harvard University Observatory, Dr. Donald Menzel, debunk the flying saucer in general and attribute the missiles to natural phenomena of one sort or another, such as temperature inversions, optical illusions, sun dogs and sub suns. He spoke before a record crowd of some 400 persons.

"Flying saucers are real and people are seeing them," Dr. Menzel told the chapter, "but they are not what people thought they saw." He said that he had seen them — that he had even made them in his laboratory — but that they are forms of natural phenomena. "Merely because we cannot prove such phenomenon . . . ." he said, "is no reason for saying that it comes from outer space."

He forcefully debunked the theory that flying saucers come from other

Shown at the January meeting of the Fort Monmouth Chapter (l to r): Col. Loren E. Gaither; Chapter President Paul Langguth; Dr. Donald Menzel, director of Harvard University Observatory, who debunked the flying saucer; Maj. Gen. J. O. Mauborgne; and Lloyd F. Christianson, president of Electronic Associates.

planets. In doing so he pointed out how quickly and easily saucer stories have grown and that the observance of flying saucer phenomena is not something new but rather dates far back in history.

Dr. Menzel attributes the saucers to some 100 types of natural phenomena. He illustrated many of them in his talk and by showing slides. Among the slides was a milkweed pod which Dr. Menzel pointed out would shine brilliantly in the sun thus giving the appearance of a saucer. Feathers from a bird and pieces of paper, both glistening in the sun, would give similar effects, he said.

Temperature inversions, it was brought out, are also the cause of many saucer illusions. He described a temperature inversion as being a layer of hot air above the ground with a cool layer underneath. This effect would create mirages. Such inversions were also described as causing radar beams to project many miles further than normal, thus causing the instrument to record objects not usually within its range and giving rise to the theory that flying saucers were material objects since they were recorded on radar screens.

Dr. Menzel compared flying saucer phenomena with that of a rainbow. He said that like a rainbow, such a phenomena would move with the individual. "Don't try to chase it (the saucer) — turn around and let it chase you," was his closing suggestion.

Commander C. G. Mayer, USNR (at left) receives the charter of the newly organized London Chapter from AFCA Executive Vice President George Dixon. Looking on are Vice Adm. Walter S. Anderson, New York Chapter President, and Col. T. L. Bartlett, AFCA national director.

Col. Norman L. Tittle was introduced as the new membership committee chairman. Other 1954 committee chairmen are: meetings—Lt. Col. John V. Fill; publicity — Peter Hoffman; reserve affairs—Maj. Melvin Werksman; industrial relations—Arthur L. Adamson; financial — Lt. Col. Morton A. Rubin.

Kansas City

Mr. Millard K. Neptune, president of the Platte Pipe Line Company, was guest speaker at the chapter's January

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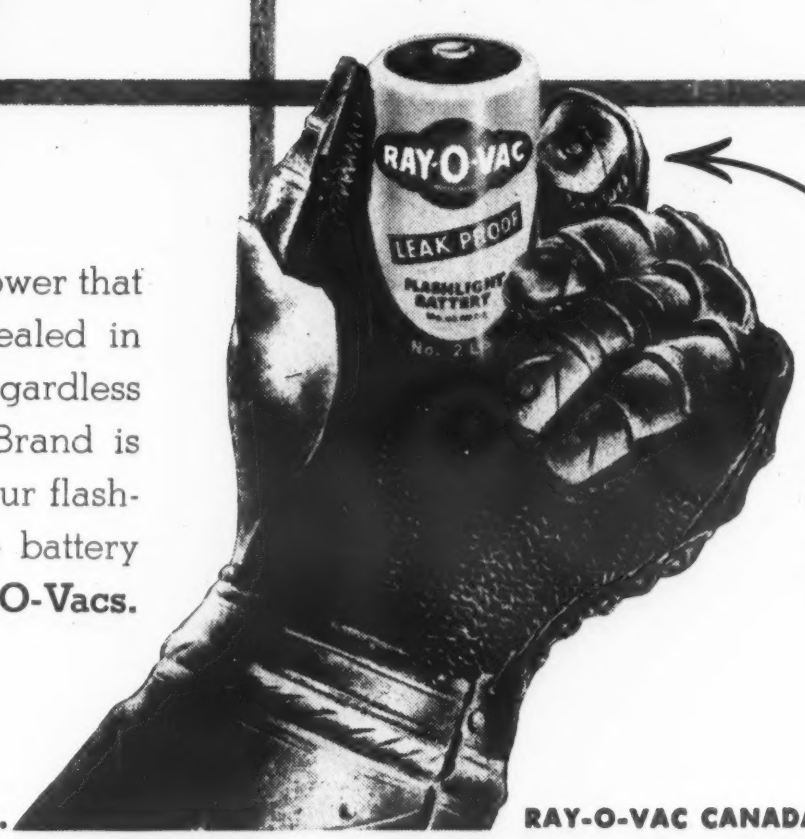

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CHAPTER NEWS

26th meeting, and gave an informative talk on pipelines and the phases of communications that are essential for efficient operation.

The dinner-meeting was held at The Wishbone Restaurant, with a social hour preceding.

At a meeting of the officers and directors on December 22nd, Rufus R. Williams of the American Telephone & Telegraph Company was elected secretary-treasurer to succeed Jerome Greene who was being transferred to New York. A vote of thanks was given Mr. Greene for his service to the chapter.

London

Following the successful activation of the Paris Chapter, it was felt that there was need for a similar chapter of the AFCA in London, and last year Commander C. G. Mayer, USNR, RCA European Technical Representative, was asked to undertaken its organization.

The London Chapter charter was officially presented to Commander Mayer by AFCA Executive Vice President George Dixon at a ceremony held in New York on February 4th. Admiral W. S. Anderson, president of the New York Chapter, and Colonel T. L. Bartlett, national AFCA director, were present. Colonel W. W. Watts, national executive committee member and former national president of the association, has also taken an active interest in this project.

Commander Mayer, who is acting as temporary president, reported that the chapter already has twenty-eight members, all American citizens, made up of Army, Navy and Air Force personnel and representatives of American industry located in Britain. Election of officers will take place shortly after his return to London the latter part of February.

Elaborating on future plans, Commander Mayer said the chapter expects to organize regular monthly dinner-meetings in London, with discussions on technical subjects of interest to members. A first order of business will be a membership drive and he urged all members to contact their friends in the London area and enlist their support of this newest AFCA unit. It is also expected that British friends, both service and civilian, will join the chapter as Associate Members and so help to further cement the bonds of friendship existing between the two countries.

The London Chapter extends a hearty welcome to any AFCA member visiting England to participate in its activities and attend its dinner-meetings. For information, contact Cdr. C. G. Mayer, 55 Pall Mall, London S.W.1; telephone Trafalgar 4532.

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New York

Raymond S. Perry, president of Federal Telephone and Radio Company, a division of International Telephone and Telegraph Corporation, was the featured speaker at New York's January 27th meeting. His subject was the "Operation of Leader-Follower Government Contracts in Procuring Electronics Equipment During Emergencies."

Mr. Perry told how a separate organization within his company, known as Department 70, was organized with the prime objective of carrying out the leader contract functions with the twelve associated radio and electronics manufacturers. He described in detail the "Leader-Follower" or "Multiplier Plan" proposed by the Signal Corps as a system of uniting and coordinating the purchasing power, labor, engineering skill, manufacturing facilities and transportation of a large number of producers in a common cause. The plan was successfully put into operation by Federal as the leader of twelve separate, independent and widely dispersed electronics manufacturers working as a team on the production of Signal Corps radio set AN/GRC 3-8, a complete and highly intricate system of radio communication between tanks, infantry and artillery.

The talk was illustrated with a showing of "Operation Multiplier," a 16mm sound color film which told the story of the successful operation of the AN/GRC 3-8 contract in an amazingly short time by industry standards. The activities of all of the twelve manufacturers, including Federal, were so effectively coordinated and the procedure so meticulously carried out that the by-product of this exactness was a high standard of interchangeability—in every piece of assembly down to the tiniest screw regardless of where it was made or which of the twelve follower contractors made it.

During the business meeting, the members unanimously approved the adoption of the revised chapter constitution, copies of which were sent to all members in December. Col. T. L. Bartlett was chairman of the constitution revision committee.

Pittsburgh Chapter officials shown at the annual Christmas party. Front row (l to r): A. N. Galone, director; W. H. Yates, treasurer; W. W. Ege, vice-president; S. E. Phillips, president; E. J. Staubitz, director; Back row (l to r): Maj. E. G. Williamson, vice-president; H. W. Shephard, secretary; H. W. Mitchell, vice-president; and F. E. Moran, director.

Chairmen of the chapter's standing committees for 1954 are: armed forces — Col. F. E. Kidwell; financial — Lt. Col. W. L. Hallahan; industrial relations — W. W. MacDonald; liaison — George W. Bailey; meetings — Lt. Col. J. A. Hartman, Jr.; membership—Col. B. H. Oliver, Jr.; reserve affairs—Col. Orville Laird.

President Walter S. Anderson announced that the following members had been elected by the board of directors and the executive committee to represent the chapter on the National Council at the annual AFCA convention in Washington in May: G. W. Bailey, W. L. Hallahan, R. F. Jewett, Col. F. E. Kidwell, D. F. McClure, T. H. Mitchell, S. F. Patten, T. N. Pope, E. R. Shute, E. W. Stone and D. Talley. Alternates: Cdr. E. S. Burns, L. R. Engler, W. W. McDonald and M. G. Nattress, Jr. With a membership of about 1050, the chapter is entitled to eleven delegates on the National Council.

Philadelphia

"The 'Surface-Barrier' Transistor for Military and Civilian Uses" was the subject of an address by William Forester, Executive Engineer, Philco Corporation, at the January 28th chapter meeting.

The meeting was held at the Philographic Auditorium, preceded by a social hour and dinner.

Pittsburgh

The chapter's attendance record reached a new high on December 12th when 275 members and guests attended its annual Christmas dinner-party at the Cedars of Lebanon Hall.

The evening started with a social hour, with the chapter providing beer and set-ups, and there was excellent music for dancing. Dinner was followed

View from the dance floor of the Pittsburgh Christmas party leaves no doubt that the affair was a tremendous success.

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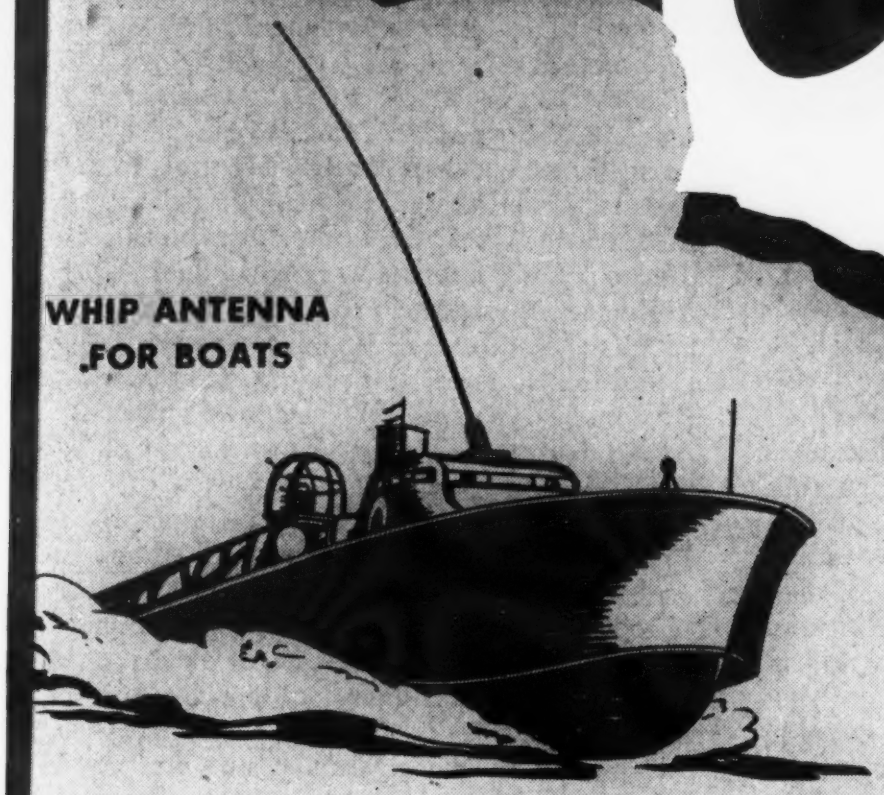

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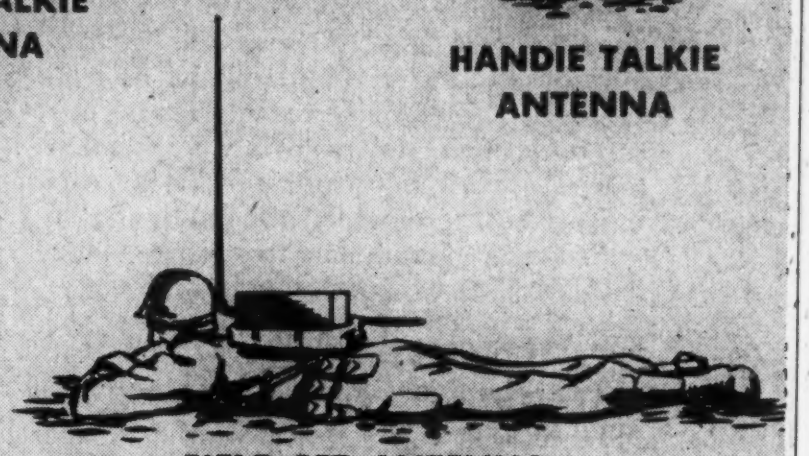

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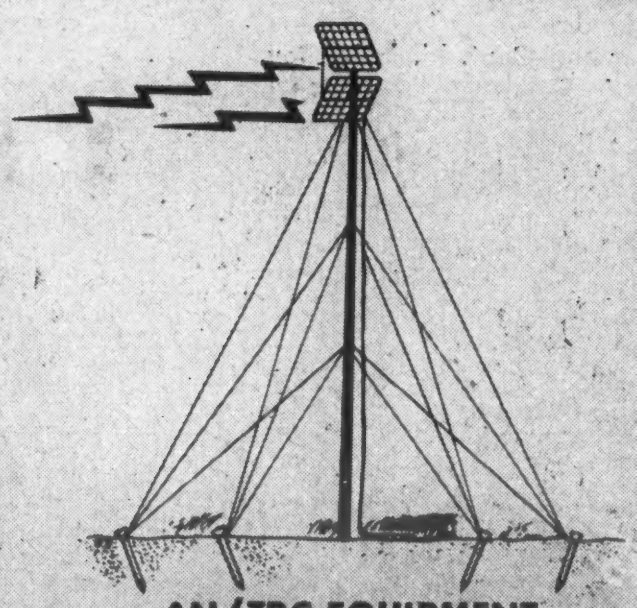

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by the drawing of a grand prize, and door prizes were distributed.

Arrangements for the meeting, including the festive decoration of the hall, were made by a committee headed by Ed Staubitz. Favors were donated by the United States Steel Corporation, and the door prizes were procured through the cooperation of Hamburg Bros. A profitable drawing was conducted by the chapter, with a 21" RCA television console as the grand prize.

The evening ended with some fancy vocalizing led by Chapter President Sam Phillips. The many favorable comments were ample evidence that the chapter had staged another very successful affair.

Sacramento

Two films, "The Rocket" and "History of Guided Missiles," comprised the program of the chapter meeting on December 16th at the Sacramento Signal Depot Officers Club.

"The Rocket" illustrated the basic principles and composition of the modern rocket and various methods employed in launching and fueling rockets. "History of Guided Missiles" was a documentary film showing the guided missile attack on England in World War II. It included excerpts from captured German films showing the laboratories, experiments and actual launching of rockets destined for England.

Program arrangements were made by C. A. Bairos and Robert McMorrow.

San Francisco

The chapter's annual meeting was held on January 21st at the New Tivoli Restaurant in San Francisco. Following dinner, President Lloyd Parsons called the business session to order for the annual reports from officers and committees, and for the election of officers.

Colonel Parsons, under whose leadership the chapter has maintained a steady growth in size and influence, was reelected president for a third term. Other officers reelected were: 1st vice-president — C. L. Wickstrom, Pacific Telephone & Telegraph Co.; treasurer — R. H. Cobb, Western Union Telegraph Co.; secretary — W. R. Patton, Lenkurt Electric Co. Cdr. S. N. Barton, Mackay Radio & Telegraph Co., was chosen 2nd vice-president; and Lt. Col. F. L. Treadway, MSTS, was elected to the newly created office of chapter historian.

Elected to the board of directors for a two-year term: Capt. M. E. McCoy, district communications officer, 12th Naval District; J. F. Parachini, Radio Marine Corp. of America; Lt. Col. W. G. Damerow, Pacific Gas and Electric Co.; Ralph A. Krause, Stanford Research Institute; Maj. T. D. Razovich, Station KFRC; for a one-year term: Col. H. L. Schnoor, Pacific Telephone & Telegraph Co.

Members of the board who have one more year to serve: Capt. D. E. McKay, USCG; Col. A. B. Cooper, Sixth Army signal officer; W. G. Phillips, Globe Wireless; Maj. G. A. Stevens, Eastman Kodak Co.; and H. E. Austin, RCAC.

At the conclusion of the business meeting, Mr. J. W. Luke of International Business Machines Corp. gave a brief talk on the use and development of electronic computers, and then showed an IBM film entitled "Piercing the Unknown." The film, which was in color, illustrated major scientific advances made possible by data processing machines.

An additional feature on the program was a Navy film, "Project Tinkertoy," which described the development of equipment for the automatic assembly of electronic apparatus.

The various guests present were introduced by Col. P. A. Wakeman, chairman of the hospitality committee. Among them were Mr. Hicri Goceoglu of the Turkish PTT and Mr. Van der Shkrouf of Bourla Brothers, Istanbul.

Scott-St. Louis

Col. Gomer Lewis, ATRC, Scott AFB, was elected president of the chapter at its January 15th meeting. Other new officers are: vice-presidents — B. Roger Robards, Southwestern Bell Telephone Co., and Col. C. E. Beasley, Scott AFB; treasurer — Lester L. Bennett, Scott AFB.

Outgoing Chapter President Allan Eisenmayer, who has served the chapter with distinction since its organization, first as secretary and then as president, again takes over the job of chapter secretary, thus providing the new officers with a valuable continuity of leadership and experience.

Directors elected for a two-year term: Earl F. Hagen, AT&T Long Lines; Col. Carlisle I. Ferris, Scott AFB; Harry E. Vermillion, Western Union; Rear Adm. Robert E. Melling, USN (ret.); Robert M. Hanson, CDA, St. Louis. Serving on the board for another year: Michael A. Ebinger, Ebinger Radio & Supply; Richard D. Conrad, Busch's Grove; J. Douglas Wagner, Alton & Southern Railroad; George M. Depew, Scott AFB; Clifford G. Wassall, Southwestern Bell Telephone Co.

Colonel William M. Talbot, Director, Warnings and Communications, Federal Civil Defense Administration, was scheduled as the principal speaker, but was delayed by a snowstorm enroute and reached St. Louis too late for the meeting. However, among those present at the meeting were a number of officials from the Denver regional and Missouri state Civil Defense Administration offices who were in St. Louis for a city-wide CDA exercise the following day. With Clifford Wassall drafted as moderator and the CDA officials as panel members, the chapter conducted an impromptu forum on Civil Defense

1954 officers and directors of the San Francisco Chapter. Front row (l to r): R. H. Cobb, treasurer; C. W. Wickstrom, 1st vice president; Col. Lloyd C. Parsons, president; LCdr. S. N. Barton, 2nd vice president; W. R. Patton, secretary; Lt. Col. F. L. Treadway, historian. Directors (l to r) in the back row: J. F. Parachini, Maj. T. D. Razovich, Col. A. B. Cooper, Lt. Col. W. G. Damerow, Capt. D. E. McKay, Col. H. L. Schnoor and Capt. M. L. McCoy.

which created considerable interest and enthusiasm.

Seattle

The history of the Alaska Communication System, its present scope of operations and expansion of facilities now under way or projected for the next two years, were discussed by Colonel Marcellus R. Kunitz, commanding officer of the ACS, at the chapter's December 17th meeting.

Colonel Kunitz reviewed the geography of Alaska to illustrate the immense distances involved and the attendant problems in providing communications and in supplying ACS installations at the many remote locations spread over the territory. He described the types of facilities used to provide long distance telephone and telegraph service between Alaskan points and between Alaska and the States. These facilities include an extensive network of radio, open wire lines and submarine cables. Service is provided for the armed forces, other government agencies and civilians.

The speaker pointed out that considerable expansion in the wire facilities of ACS has taken place in the past two years with additional facilities being added currently, and that there will be further expansion during the next two years. These new facilities provide telephone and telegraph circuits principally over standard commercial type carrier systems.

A series of slides were used to illustrate Col. Kunitz' talk.

The chapter was saddened to hear an announcement that Frank D. Keyser, former chapter president, had recently passed away following a long illness. All stood for a minute of silent tribute to his memory.

The dinner-meeting was held at the Officers' Club, 13th Naval District Headquarters, with Capt. Lester M. Hill, District Communications Officer, as host. There were 52 members and guests present.

The chapter's annual elections were held on January 13th, with the following slate voted into office: president—Warren J. Taylor, Puget Sound Power & Light Co.; 1st vice-president — Lt. Col. Elmer R. Higgins, ACS; 2nd vice-president—Gerald L. Archibald, Naval Receiving Station; secretary — Merrill R. Stiles, ACS, who will be serving his fourth term in this capacity; treasurer — Lee David, National Film Productions. Trustees: Alfonzo A. Baird, Western Union, retiring chapter president; Col. M. R. Kunitz, ACS; Lt. Herman F. Helgesen, USCG; Theodore W. Copeland, ACS.

President Baird expressed his appreciation to the chapter for the privilege of serving as its president during the past year, and for the cooperation he had received. He then introduced the new officers and trustees and turned the meeting over to the new president. Warren Taylor, who briefly outlined plans for the year, stressing particularly the need for a larger membership.

Busy?
of course you are —
but — when you receive your registration card for the AFCA convention, check off the events you will be attending, return the card by mail, at once and consider the time well spent —
then — grab your hat around May 6th and head for Washington.

Scott-St. Louis Chapter featured Civil Defense at its January meeting. Front row, l to r: Lawrence Miller, CD Director, E. St. Louis; Al Tilley, Regional Director, CD, Denver, Col.; A. S. McDaniel, Missouri State CD Director; R. M. Baker, Supply Officer, FCDA; Allan Eisenmayer, retiring chapter president. Back row, l to r: R. F. Read, Emergency Operations Officer, FCDA; William Lutz, CD, Kansas City, Mo.; Gen. F. P. Hardaway, Director, St. Louis CD; Clifford Wassall, Defense Activities Engineer, Southwestern Bell Telephone; Col. Gomer Lewis, new chapter president; and Robert Hanson, Chief of Operations, St. Louis CDA.

The evening's program was conducted by Capt. Frank K. Johnson, Captain of the Post, U. S. Coast Guard, Seattle. Captain Johnson reviewed the duties and activities of the Coast Guard and then showed two films — the first gave a comprehensive story of Coast Guard activities and the second depicted weather ship operations.

Southern Connecticut

Colonel Angus Walker, who was formerly Chief Photographic Officer of the Far East Command and was awarded the Legion of Merit medal for his outstanding work in Korea, was guest speaker at the chapter meeting on February 9th. Now retired from the service, Colonel Walker is with the National Pneumatic Company of Boston.

He related his experiences before and during the Korean conflict, illustrating his talk with still and motion pictures. The films were directly related to the work of a combat photographer, and he showed one film which he personally produced on the processing and treatment of prisoners of war.

Colonel Walker's talk was received with considerable enthusiasm and generated an interesting discussion period at its close.

The buffet supper and meeting was held at Cobb's Mill Inn, Weston, with some fifty members and guests present.

Washington

The Washington Chapter devoted its February 3rd meeting to "Civilian Prospects for Atomic Energy," with Charles Robbins, Executive Manager, Atomic Industrial Forum, Inc., as the featured speaker.

Rear Admiral Lewis L. Strauss, Chairman of the Atomic Energy Commission, headed the list of distinguished guests at the head table who were: Maj. Gen. Leslie E. Simon, Chief, Research and Development, Army Ordnance; Brig. Gen. Reginald P. Lyman, Chief, Plans & Operations Div., OCSIGO; Dr. Allen V. Astin, Director, National Bureau of Standards; Rear Adm. Frederick R. Furth, Director, Office of Naval Research; Dr. George Lyon, atomic medicine specialist, Veterans Administration Medical Division; Rear Adm. Wilson D. Leggett, Chief, Bureau of Ships; Dr. L. S. Taylor, Chief, Atomic and Radiation Physics Division, National Bureau of Standards; Maj. Gen. Emil Lenzner, Commanding General, Electronic Warfare, Fort Huachuca, Arizona.

Mr. Robbins reviewed the circumstances existing when the Atomic Energy Act of 1946 was dratted, making atomic energy the property of the government. Despite the fact that the reasons for drafting the Act are not valid today, he pointed out, a great deal has been accomplished in the administration of the law and many peaceful developments have taken place. He then went on to describe some of the potential applications of atomic knowledge.

". . . . Business is going to have an opportunity to participate as a full partner in atomic energy only if it becomes well-informed, understands something about what atomic energy is and what it offers, and if it helps in the process of educating others. The law will be changed only if enough people — including business people — want it changed. If monopoly gives way to business enterprise here will be an industry which will offer greater opportunities to each of us, and the realization of those opportunities will surely make for a stronger people, better living and a peaceful world."

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AND, LAST YEAR, the Society was able to allocate $5,000,000 of your donations to research aimed at finding the ultimate cure for *all* cancer. That's more money than ever before.

MUCH MORE, of course, remains to be done. So please make *this* year's gift a really *generous* one!

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MAN'S CRUELEST ENEMY
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AMERICAN CANCER SOCIETY

Late News

The Tinker-Oklahoma City Chapter was officially chartered by AFCA Executive Vice President George Dixon on February 18th at a dinner-meeting in downtown Oklahoma City.

In presenting the charter, Colonel Dixon reviewed the history of the association and stressed its present-day aims and purposes. He described activities of other AFCA chapters throughout the country and gave the new chapter a number of suggestions for assisting them in their future plans.

Colonel Dixon also attended preorganizational meetings of two embryo chapters — the North Texas Chapter which will cover the Dallas-Fort Worth area, and the South Texas Chapter which will cover San Antonio and adjacent territory.

The North Texas Chapter has been activated by Col. Thomas F. Yates, Sig Res, of the Southwestern Bell Telephone Company, and Col. John Mearsch, Communications Officer of the 8th Air Force.

Col. George L. Richon, Signal Officer of the Fourth Army, is chairman and Lt. Col. Charles A. Wingo secretary of the South Texas Chapter organization committee, which includes Col. Edgar A. Sirmyer, Jr., Director of the Air Force Security Agency, Col. Francis B. Morgan, USAF, and officials of the Southwest Research Institute.

Navy's new radio "Voice" dedicated to America's security

WORLD'S MOST POWERFUL MILITARY RADIO TRANSMITTER
A 6-YEAR NAVY-RCA PROJECT!

On Jim Creek, in the State of Washington, stands the world's most powerful military radio transmitter—its giant antenna stretches from mountain peak to mountain peak.

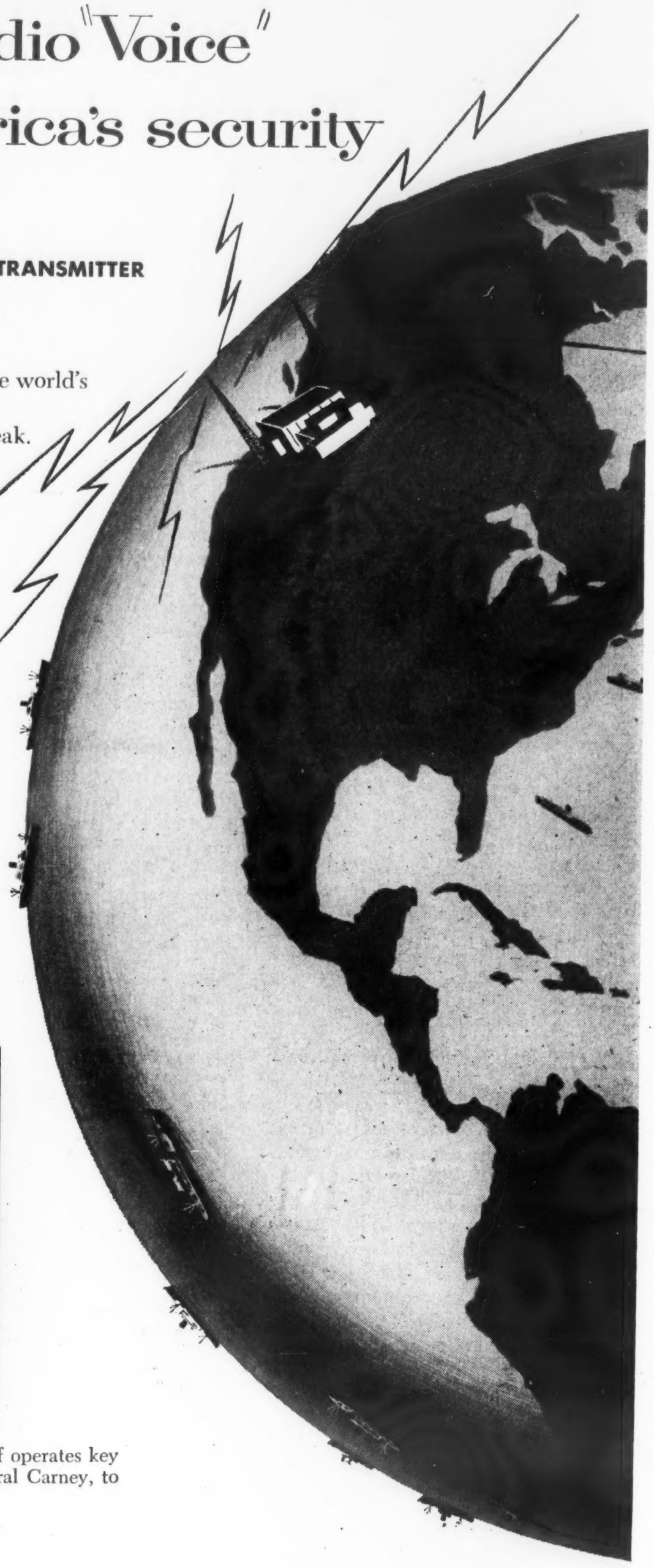
A 6-year project of the Navy and RCA, "Big Jim" was built and installed to provide the Navy, for the first time, with instant communications with naval units everywhere, on the seas and under the seas, on land and in the air.

Speaking at the dedication ceremonies, Brig. Gen. David Sarnoff, Chairman of the Board of RCA, said:

"May I express the wish, which I know all in our Armed Services share, that this powerful instrument for transmitting intelligence may add to our national security and to the peace of the world."

The first message flashed by the "Big Jim" transmitter was from Admiral Robert B. Carney, Chief of Naval Operations, to U. S. Navy personnel around the world. He said:

"With this message we forge another link between you and your homeland. With it, we build a new security channel from America to the naval units which form its outer ramparts of defense."



AT DEDICATION CEREMONIES—General Sarnoff operates key to transmit first message, dictated by Admiral Carney, to fleet units around the world.

RCA®

RADIO CORPORATION OF AMERICA

World leader in radio—first in television

NEWS

Communications-Electronics-Photography

VOLSCAN CONTROLS PLANE LANDINGS ELECTRONICALLY

A revolutionally electronic device for controlling incoming planes at busy air bases has been revealed to the public by scientists of the U. S. Air Force's Cambridge Research Center.

VOLSCAN, the popular name for the system, is an automatic system for bringing aircraft into a base at precise intervals of thirty seconds. In thousands of flight tests with many types of jet and propeller-driven planes during the past year, the system has proved to be the long-sought means of eliminating the "stacking up" of planes over busy military and civilian airports.

VOLSCAN can easily handle a rate of 120 aircraft per hour.

Known officially as "Air Traffic Control Central, AN/GSN-3," the system is not a radar set; rather it is a combination of electronic, tracking, and computing units which are capable of automatic control of all planes approaching an airport.

Despite the complex portions of the apparatus, the system according to scientists, is "basically simple," and will cost approximately $100,000 per air base.

New Electronic Modular System Aids Design and Development Engineers

A basic new electronic tool of great flexibility in the design and use of pulse methods for information transmission, storage and computation has been announced recently by Audio Products Corporation of Los Angeles.

Called the Modular System of Digital Pulse Units, the system consists of sixteen electrically and mechanically compatible "Modulars" which perform all the basic functions of digital pulse operations, such as gating, pulse forming, counting, coincidence marking, etc., as well as simpler electronic tasks like amplification, signal inversion and impedance matching.

Since each unit (size 2¾" high x 4½" wide x 9" long) performs a multiplicity of independent functions selectively, a complete system consisting of 16 Modular units and a regulated power supply has a capability of 72 separate functions with as many as 31 functions simultaneously available.

Simple digital instruments such as events-per-unit time meters, time interval meters, complex high speed electronic switches, stylized pulse generators, and the like, can be quickly patched up by using the Modular system.

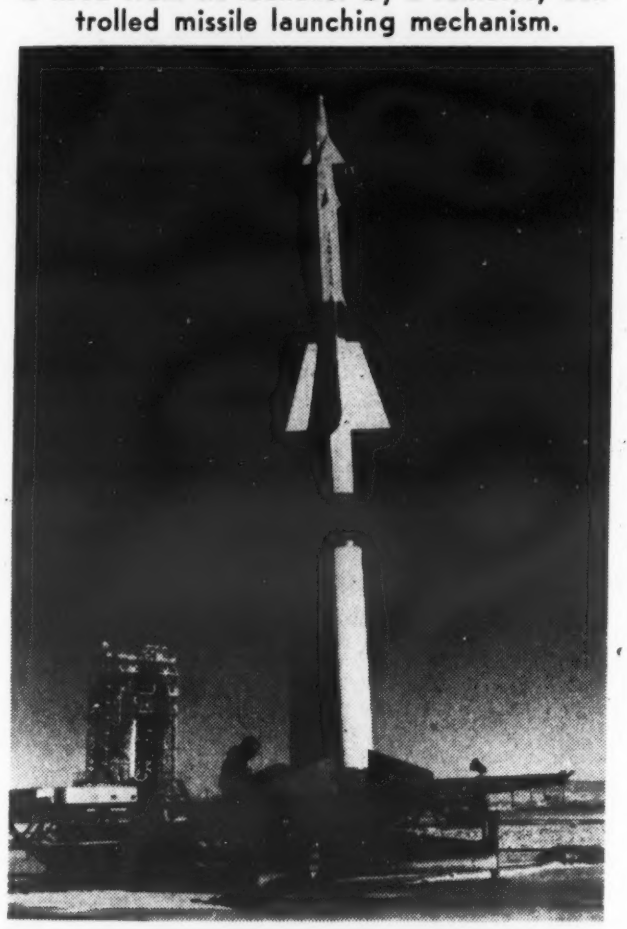
BENDIX COMPLETES JET COMPONENT TEST UNIT

The Bendix Aviation Corporation has completed installation of the nation's most extensive research facility for exclusive testing of component equipment for jet aircraft and missiles.

Constructed to provide data on the performance of air turbine driven accessories at speeds up to supersonic levels and in atmosphere conditions ranging from sea level to 80,000 feet, the new facility is destined to save thousands of man-hours of engineering research.

In a few seconds the new facility can simulate the actual conditions under which these jet accessories will operate, including temperatures as low as minus 100 F. All test conditions are controlled from control consoles including the latest combinations of electronic, pneumatic and electrical equipment.

NIKE, The Army's first supersonic guided missile to demonstrate its ability to knock enemy aircraft out of the sky, can outmaneuver bombers, fighters or transport planes. The missile is approximately 20 feet long and about one foot in diameter. NIKE is fired from its launcher by a remotely controlled missile launching mechanism.



Typical of the products which the facility's engineering development work will serve are afterburner fuel pumps, water alcohol pumps, turbine-driven alternators, bleed and burn turbine-driven accessories, cabin supercharger equipment, aircraft cooling equipment, pneumatic starters and various other types of turbine-driven auxiliary equipment.

This new testing facility produces all possible simulated flight conditions for Bendix components through control of six basic functions: exhaust vacuum, air pressure, air temperature, fuel temperature, temperature for auxiliary cooling, and fuel-tank pressure and vacuum.

Power and primary equipment to provide these services are housed in an equipment building which is linked by numerous headers to a separate building which contains secondary control panels and test cells. The project area also includes a water cooling tower which recirculates the water utilized by the compressor, exhauster, refrigeration systems, and various other heat exchangers in the facility.

Horsepower in the equipment building is rated at more than 3,000. This includes centrifugal and rotary exhausters, high pressure air compressors, and freon-brine and alcohol refrigerating systems.

Remler Introduces Transistor Microphone

Tiny transistors have been applied successfully to the problem of developing a microphone to improve the quality of radio voice communication between pilots and airport control towers.

Developed by Remler Company Ltd., this new unit consists of a magnetic microphone or handset with built-in transistor pre-amplifier.

It is not necessary to re-wire aircraft or other mobile installations to use the Remler microphone. It derives its power supply from the same sources as the carbon microphones

now used and may be plugged directly into existing equipment.

This new microphone suppresses extraneous noises and more than triples the range to include voice frequencies from the lower part of the sixth through the ninth octave. This eliminates confusion in understanding letters like "b" and "v" so that it is no longer necessary to repeat messages in the "B as in boy, V as in Victor" routine, which is often impossible in an emergency.

The flying and hissing sounds created by temperature changes or mere handling of the carbon type microphone are absent in the new transistor microphone. Its performance is stable; it is not appreciably affected by rough usage or changes in altitude or humidity.

ARMA DEVELOPS SUB-MINIATURE SIZE ANALOG COMPUTER COMPONENT

• An analog computer component of sub-miniature size (approximately three cubic inches) has been developed recently at the new research, development, and manufacturing center of Arma Corporation of New York.

The new computer component, hardly the size of a pack of cigarettes, does its calculations by the interchange of heat, has no moving parts, and is mass producible.

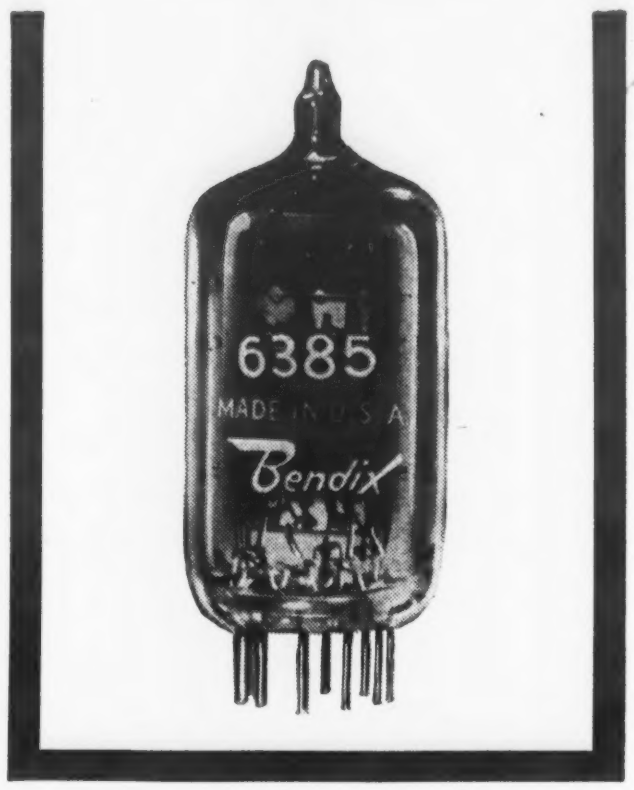
It promises to be tremendously important in the automation of airborne equipment as well as of land and sea-based equipment and in the automation of a variety of things for industry and commerce.

This device adds, subtracts, divides, integrates, and performs basic operations of vector algebra and vector calculus as well as other mathemathical operations five times as fast as the swiftest previous machinery for solving such problems.

This new computer component enables engineers to make control systems for such purposes as navigation at supersonic speeds, automatic gun-laying, guiding missiles, and automating machines and processes that are five times as sensitive as any they have had before.

Radio and Telephone Repair Service in Korea

HQ X CORPS, KOREA — "Door to door" service is the theme of operations for team "C" of the 205th Signal Repair Company, which provides radio and telephone equipment re-



Ruggedized and aged

"RELIABLE" DOUBLE TRIODE

Do you have an aircraft or industrial application that requires *utmost* dependability in increasing or controlling alternating voltages or powers . . . in changing electrical energy from one frequency to another . . . or in generating an alternating voltage?

If so, specify the Red Bank RETMA 6385 "Reliable" Double Triode. For it is specially ruggedized to perform at top efficiency longer, even under operating conditions of severe shock and vibration. And, as further assurance of its extra reliability, each RETMA 6385 is factory-aged with a 45-hour run-in under various overload, vibration and shock conditions, such as it might meet on the job.

Whether you need tubes as amplifiers, mixers, or oscillators, it will pay you to investigate the superior, longer-lasting performance qualities of the Bendix Red Bank RETMA 6385.

RATINGS*

Heater voltage—(AC or DC)**	6.3 volts
Heater current	0.50 amps.
Plate voltage—(max.)	360 volts
Max. peak plate current (per plate)	25 ma.
Max. plate dissipation (per plate)	1.5 watts
Max. peak grid voltage	+0 volts / −100 volts
Max. heater-cathode voltage	300 volts
Max. grid resistance	1.0 megohm
Warm-up time	45 sec.

(Plate and heater voltage may be applied simultaneously.)

*To obtain greatest life expectancy from tube, avoid designs where the tube is subject to all maximum ratings simultaneously.

**Voltage should not fluctuate more than ±5%.

PHYSICAL CHARACTERISTICS

Base	Miniature button 9-pin
Bulb	T-6½
Max. over-all length	2 3/16 in.
Max. seated height	1 13/16 in.
Max. diameter	⅞ in.
Mounting position	Any
Max. bulb temp.	160° C

AVERAGE ELECTRICAL CHARACTERISTICS

Heater voltage, E_f	6.3 volts
Heater current, I_f	0.50 amps.
Plate voltage, E_b	150 volts
Grid voltage, E_c	−2.0 volts
Plate current, I_b	8.0 ma.
Mutual conductance, g_m	5000 μmhos
Amplification factor, μ	35
Cut-off voltage	−10 volts
Direct interelectrode capacitances (no shield)	
Plate-grid (per section)	1.7 μμf
Plate-cathode (per section)	1.1 μμf
Grid-cathode (per section)	2.4 μμf
Plate-plate	0.1 μμf

Bendix Red Bank

Manufacturers of Special-Purpose Electron Tubes, Inverters, Dynamotors and Fractional HP D.C. Motors

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pair service for 32 separate Eighth Army units in the X Corps area.

Commanded by 2nd Lt. Robert V. Weber of La Crosse, Wisconsin, the 35 man team consists of six sections. Each section is continually on the move throughout the X Corps area.

At each stop an inquiry is made as to the condition of the radio and wire equipment within the unit. Any necessary repairs are made on the spot. In this way a separate trip for each service call is eliminated, service is much faster and the condition of the radio and wire equipment is kept at a constantly high level.

The crews make their home in the trucks. Their inventory is periodically replenished by an inventory distribution vehicle that meets the trucks at predetermined points.

Technical advisor Cecil L. Bowlin, on contract from Philco Corporation, is on hand in the company area to render opinions on any knotty problems that might arise.

An on-the-job training program is conducted for team replacements. While serving their "learn by doing" apprenticeship, the men become expert in repair of equipment ranging in complexity from the "double easy eight" field telephone to the "angry nine" mobile transmitter.

Raytheon Develops Silicon Transistor

The transistor, mighty midget of electronics, has now been made of silicon, and thereby promises to extend its usefulness far beyond the possibilities envisioned in 1953 when the germanium transistor first became available in commercial quantities.

The successful development of experimental silicon transistors was announced recently by N. B. Nichols, manager of Raytheon Manufacturing Company's research division.

These transistors have been tested at temperatures up to 350 degrees fahrenheit. Hardly larger than kernels of corn, they replace many kinds of vacuum tubes as large as electric light bulbs.

Until now, transistors have been "cold operating" devices. Characteristics of germanium made them unable to withstand much heat. Certain applications involving high wattage and the resultant high temperatures, or applications with high ambient temperatures, have not been practical. The new Raytheon transistors of silicon are expected to overcome most of these difficulties.

Raytheon has announced that sufficient tests of its new silicon junction transistor have been made to establish its principles. However, according to a company spokesman, it is not expected that silicon junction transistors will be made available for some time to come.

National Scientific Laboratories Publish Research Bulletin

Beginning last December, National Scientific Laboratories, Washington, D. C., began publication of the *Transistor Research Bulletin*.

The organization plans to publish this bulletin every two months with the primary objective of keeping its readers up to date in the rapidly expanding field of transistors and diodes and other solid state devices.

In the first issue, Editor Michael C. Ellison stated that not only will the field of such devices themselves be covered but articles on related components for use with them will also be included in the Bulletin.

IRE To Hold Convention in New York

The Institute of Radio Engineers will hold its 1954 National Convention at the Waldorf-Astoria and Kingsbridge Armory in New York City, on March 22, 23, 24 and 25.

A comprehensive and informative program of technical sessions, Professional Group symposia, and engineering exhibits have been assembled.

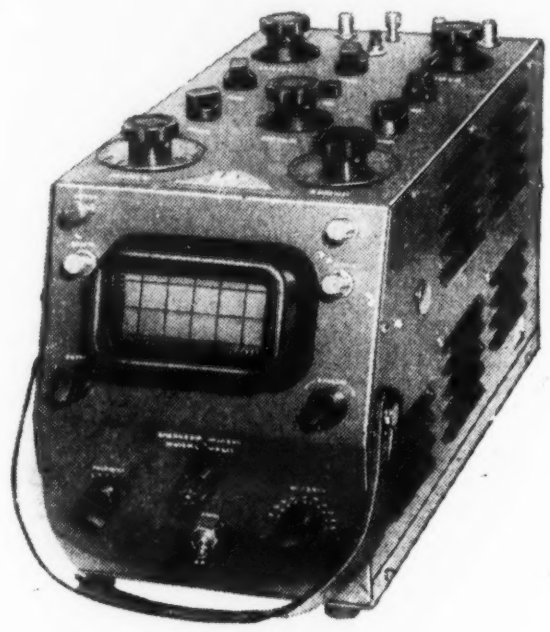
The Radio Engineering Show with its 600 exhibits will be housed in the Kingsbridge Armory. Sessions of the extensive technical program will be held both at the Armory and at the Waldorf-Astoria.

On Wednesday evening the Grand Ballroom of the Waldorf will be the scene of the Annual Banquet at which Dr. Alfred N. Goldsmith, Editor Emeritus and co-founder of the IRE, will receive the Founders Award and will deliver the major address on the topic, "IRE—Past and Future." There will also be an acceptance speech by Dr. William L. Everitt, recipient of the Medal of Honor.

WATERMAN INTRODUCES NEW PULSESCOPE IN POCKETSCOPE SIZE

Waterman Products Company, of Philadelphia, has introduced a new and different Pulsescope in Pocketscope size.

The new instrument features instantaneous direct-reading D.C. calibration of either positive or negative going signals. With a vertical amplifier sensitivity of 9.2v rms/inch, response from DC to 5 mc within 3db or pulse rise of .1 us. and internal intensity modulated markers of 1, 10, 100, or 1,000 us., this instrument becomes highly versatile.



Repetitive or trigger sweep is variable from 5 cycles to 500kc with 5X sweep expansion. Sweep, marker and DC calibrating voltage are available externally.

The Pulsecope operates from 50 to 400 cycles at 115v AC and weighs 22 lbs.

Platt Electronics and Link Radio Corporation Combine

Link Radio Corp., one of the largest manufacturers of mobile radio equipment, has announced the transfer of stockholding interests to Mr. Murray Platt, who was elected president.

Mr. Platt, pioneer in the field of electronics for the past 23 years, is also president of Platt Manufacturing Corp. which is engaged in the manufacture of a new line of mobile radio equipment and defense production.

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Specification designed BG bags, CW bags, clip cases, tool rolls, bags, cases, tents & tarpaulins . . . for ordnance, radio, electronic & radar equipment.

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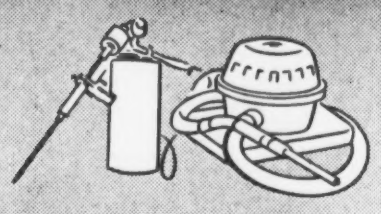
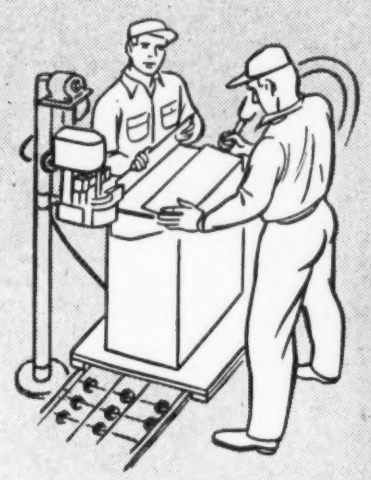


● SPECIAL ASSEMBLY EQUIPMENT

● EXPERTS IN MILITARY SPECIFICATIONS



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● FULL COMPLIANCE IN EVERY DETAIL

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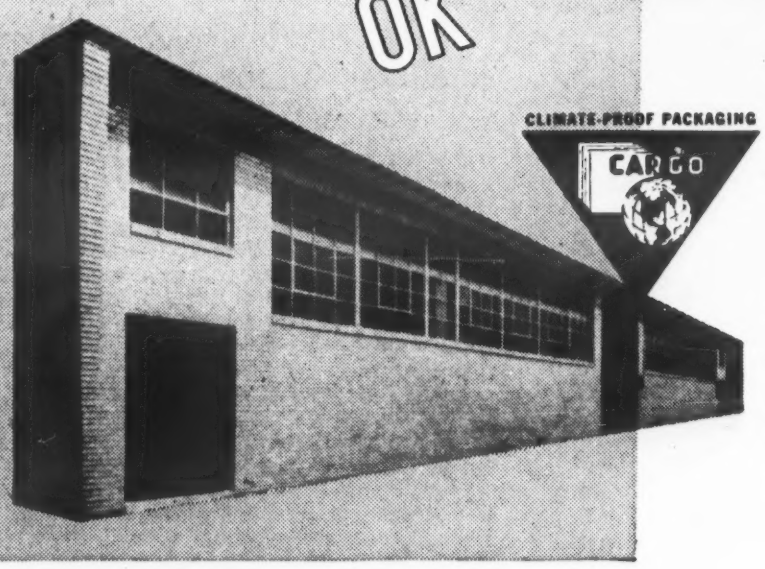

—SERVING THE Electronics Industry

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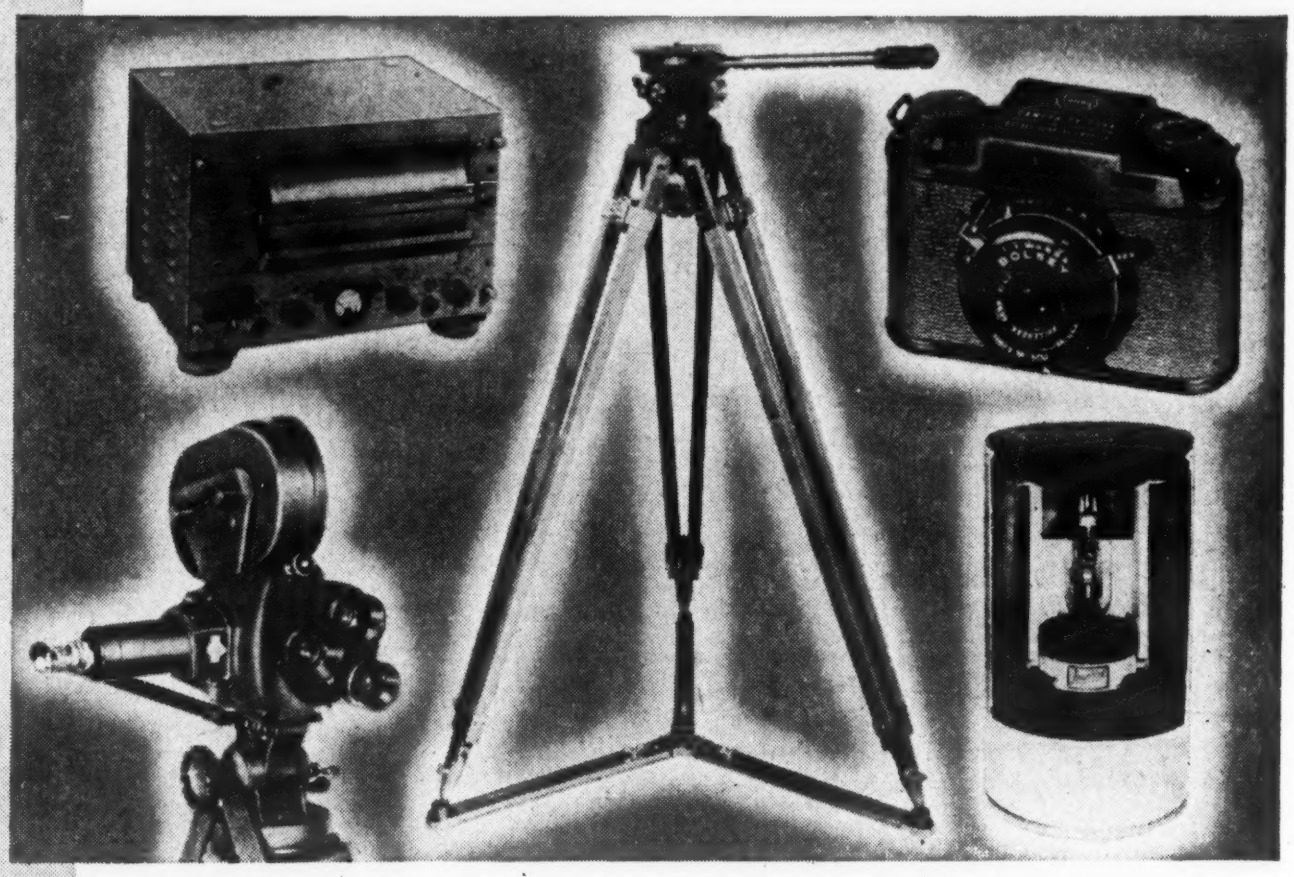
Cargo Packers engineers are experts in meeting the needs of the military. Years of experience in protecting delicate photographic, electronic and aircraft equipment for world wide distribution assures complete protection under all conditions encountered in transit and storage anywhere. Cargo Packers packaging engineers have the ability, method and equipment to safeguard the most delicate apparatus against shock, vibration, humidity and temperature.



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NEWS

Complete reorganization is planned whereby Link's leadership in the mobile radio communication field will be extended both domestically and internationally.

SURPLUS PROPERTY DISPOSAL BY SIGNAL CORPS INFORMATION

Surplus property is released for disposal by Property Disposal Officers at Signal Corps depots and designated Army areas after the property has been screened by the Department of Defense and by the General Services Administration along with other agencies for Federal requirements.

This is done in accordance with the Federal Property and Administrative Services Act of 1949.

Material which the Signal Corps currently intends to dispose of includes electronic and wire communication equipment and supplies, photographic equipment and supplies, hardware and tools. This material is no longer needed by the Army in current operations, or in stockpiles. The Army believes it is good economy to dispose of it to eliminate maintenance cost and to free needed warehouse storage space.

For further information, a list is available from the Office of Technical Liaison, Office of the Chief Signal Officer, with the locations of Property Disposal Officers throughout the country.

Electronic Components Symposium In Washington

The 1954 Electronic Components Symposium will be held in Washington, D. C., at the Department of Interior Auditorium on May 4, 5, and 6.

The Symposium will open with a welcoming address by Mr. M. Barry Carlton of the Office of the Assistant Secretary of Defense for Research and Development, Chairman of the Symposium.

On Tuesday, May 4th, the morning session will hear executives express their views on components. There will be talks by the following representatives of government and industry: the Honorable Donald A. Quarles, Assistant Secretary of Defense for Research and Development; Major General George I. Back, USA, Chief Signal Officer; R. C. Sprague, Chairman of the Board of Sprague Electric Company; C. H. Elmendorf of Bell Telephone Laboratories, Inc.; R. S. H. Hylkema of Philips Industries, and Dan E. Noble, Vice President of Motorola, Inc.

The afternoon session will consider the relationship of materials developments to component progress. Chairman of this session is J. T. Brothers of the Philco Corporation.

Subsequent sessions will include talks on solid-state devices and companion components; new frontiers in component development; component requirements for computers, guided missiles and other new applications; and automation—its impact on components.

Further information can be obtained by contacting Arthur E. Zdobysz, Room 206, Number One, Thomas Circle, Washington 5, D. C.

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Must have experience calling on various Engineering and Procurement Divisions of the Defense Establishment and important prime contractors engaged in electronics and electron-optics, and must have established following. Excellent opportunity for an aggressive liaison personality with successful sales closing record to grow in a progressive company by actively representing Company's Engineering Division before electronic and electron-optic activities of the Defense Establishment.

Submit resume, highlighting experience, to:

President

FREED ELECTRONICS and CONTROLS CORPORATION

200 Hudson St., New York 13, N. Y.

General Industrial Co. Announces Line of 'See-Thru' Cabinet Drawers

The General Industrial Company of Chicago has announced production of a complete line of "See-Thru" drawer cabinets for small-parts filing and storage in factories, offices and home workshops.

Model J-20 consists of twenty crystal-clear plastic spillproof drawers, 5⅞ inches long x 2¾ inches wide x 1 7/16 inches high, in a welded all-steel cabinet. Adjustable drawer dividers and identification labels are included.

Airborne Electronics Convention To Be Held in Dayton

The Dayton Chapter of the Institute of Radio Engineers and the Professional Group on Aeronautical Electronics of the IRE are co-sponsoring the 5th Annual Convention on Airborne Electronics at the Dayton, Biltmore Hotel in Dayton, Ohio.

The dates of the Convention are May 10, 11, and 12.

Recognizing the increased impact of electronics in aviation, this conference will put before industry and the Services, as in past years, a comprehensive program covering this broad field of aeronautical and navigational electronics.

The National Conference on Airborne Electronics will have as its theme for the year 1954, "Electronics—The Key to Air Supremacy."

Sprague Issues New Catalog on Military Wirewound Resistors

Sprague Electric Company of North Adams, Massachusetts, has published a new catalog on Power-Type Fixed Wirewound Resistors manufactured in accordance with the requirements of Military Specification MIL-R-26B.

The new Catalog 101 shows the complete series of standard resistor values and maximum permissible currents for these resistors.

The catalog is intended to serve as a ready, handy reference guide for engineers and purchasing agents specifying and buying resistors to meet the stringent performance requirements of the Department of Defense.

Capt Boland Raytheon's Washington Manager

Captain John N. Boland, USN (Ret.), has recently been appointed manager of Raytheon Manufacturing Company's office in Washington, D.C.

Capt. Boland became associated with Raytheon three years ago when his broad background of experience in electronics was directed into the fields of government liaison and contracts.

From 1945 through 1948 he was in charge of the fire control radar research and development section of the Navy's Bureau of Ordnance.

Capt. Boland is an active member of the AFCA.

ON THE MOVE?

Then, *please*, let us know about it so that your address can be changed on our records and you'll receive SIGNAL and the Newsletter without interruption.

NEWS

PUNCH PRESS WITH ELECTRONIC BRAIN DEVELOPED BY GENERAL ELECTRIC

An automatic punch press with an electronic brain has been developed by General Electric at its Electronics Laboratory at Syracuse, New York. Its techniques are being adapted to electronic equipment fabrication under a U. S. Army Signal Corps contract.

Directions are fed to the punch press by an electronic digital computer. The computer "reads" a perforated card which has information on size, number and location of the holes to be punched. The punch press automatically positions the material to be perforated and performs its punching operations within an accuracy of a few thousandths of an inch.

The punch press will be removed from the laboratory in the near future, and will be placed in a factory for further development and experimental use to determine if it is a practical means for increasing worker productivity in other areas.

Automatic punch press, developed by scientists at General Electric's Electronics Laboratory at Syracuse, N. Y. Checking operation of the electronic brain, and punching accuracy, are John Rupper (left) and Frank M. Rives, of the G-E Electronics Laboratory.

The techniques employed to make the punch press perform automatically may well be applied to a number of other industrial operations. These include drilling, riveting, stapling, electrical testing and many others.

The automatic assembly system being developed for the Signal Corps will place from 10 to 50 standard components, such as resistors and subminiature tubes, on printed wiring boards at a rate of 30 per minute. This rate can be increased on any one production line by using additional placement machines.

The entire system, scheduled for completion in 1955, will be supervised electronically by means of perforated cards, which will contain the various programming information.

The automatic assembly system is not intended to produce completed products such as radar or television sets, but will produce printed circuit sub-assemblies for electronic equipment.

Registration and Agenda Information about the AFCA 8th Annual Convention appears on pages 33, 34, 35 and 36.

NEW

THE RWG-2308
HAND GENERATOR

Another HOLTZER-CABOT "first" in the communications field!

This lightweight, rugged generator, the latest addition to a long list of HOLTZER-CABOT "firsts" in the communications field, is designed for use in field telephones, switchboards, radio control units and other communications devices and test sets. It is mechanically and electrically interchangeable with other types of generators now in use.

Several features of this new unit are especially noteworthy. Starting, cranking torque is limited to a maximum of 2½ inch pounds by means of a specially shaped unsymmetrical pole shoe arrangement . . . a design feature unique in the field of hand generators.

A special cut-in switch, incorporating a dashpot, allows the line to discharge its electrical energy before the talking circuit is re-established, thus eliminating acoustical shock in the telephone receiver.

OTHER SPECIFICATIONS ARE: • Weighs less than 23 ozs. • 2⁹⁄₁₆" Diam. 2¹⁵⁄₃₂" Long • Meets requirements of specification MIL-G-11994 (SIG C) • Hermetically sealed, fungicidal treated • At 200 R. P. M. produces 20 cycles AC at 1.75 watts, open circuit voltage of 95-105 volts.

For additional information write J. J. Anderson, Sales Manager, Holtzer-Cabot, Telephone Equipment Division, National Pneumatic Co., Inc., 125 Amory Street, Boston 19, Massachusetts.

Holtzer-Cabot is the principal supplier of power ringing equipment to the telephone industry.

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TELEVISION

TELEVISION INDUSTRY REVIEWS AND PREDICTS

In statements reviewing the past year, four large television corporations cited 1953 as a prosperous year for the industry. 1954 is viewed with confidence as year of progress.

Brig. Gen. David Sarnoff, Chairman of the Board of the Radio Corporation of America, named three factors as setting the stage for 1954 to be the "Introductory Year" of color television. They are:

1. Progress in the development of color television.

2. Approval by the Federal Communications Commission of signal standards based on the RCA compatible color system.

3. Preparation by stations for colorcasting.

"Science and engineering in 1954 will move forward to new achievements and to electronic refinements of older services, the groundwork of which already has been laid," he said. "Based upon standards of the past, 1954 should be a good year for the radio-television electronics industry. This does not necessarily mean that new records will be made in production and sales. It is more likely that a moderate degree of economic adjustment will take place in many industries throughout the year. But this can be achieved without dislocation of our economy."

William Balderson, President of the Philco Corporation, declared that the American industrial system demonstrated its tremendous vitality in 1953 by turning a year of transition into the most prosperous period in history.

Philco achieved a new record in television sales volume in 1953.

"1953 will go down in history as the birth year of color television," Balderson stated. "With approval by the Federal Communications Commission of a new set of broadcast standards for color and black-and-white television, the industry has protected the public's investment of seven billion dollars in television sets now in use."

Business should look ahead to 1954 with confidence and put an end to recession talk, he added.

In his year-end review, W. C. Johnson, Vice President of Sales of the Admiral Corporation, predicted that 200 to 250 new television stations will inaugurate operations during 1954.

Approximately 350 television stations were already on the air by January, 1954, providing service for an estimated 85 per cent of the nation's population.

Johnson stated that the FCC's approval of the compatible color standards was welcomed by the industry and provided a speedy go-ahead to a phase of the TV business that has been clouded in confusion during recent months.

"Admiral expects to produce 30,000 color television receivers during 1954, while the entire industry should be able to make 200,000 color sets, barring shortages of picture tubes," he said.

T. J. Newcomb, Manager of the Westinghouse Television-Radio Division, takes a more moderate view, stating that is is too early to make any accurate predictions on production due to the short supply of color tubes and other components.

As he viewed the situation, he declared that it is improbable that the television industry generally will be producing color sets in great quantity during 1954.

Newcomb went on to say, however, that should tubes and other critical parts become sufficiently available, Westinghouse will be in a position to meet the sales demand by the end of 1954.

He emphasized that just as soon as technological advances and increased production enables Westinghouse to pare color television production costs, the savings will be passed along to the TV buyer.

DU MONT DEVELOPS SLIDE SCANNER TO TEST COLOR TV SIGNALS

The Allen B. Du Mont Laboratories, Inc. have recently announced the development of a "Colorvision Slide Scanner" which will aid greatly in the development of color television by providing broadcasters and manufacturers with a video source for test purposes.

The new Du Mont "scanner" will be used to provide manufacturers with exceptionally clear and reliable color signals which will be used to test the color receivers now being designed.

The Colorvision Slide Scanner is composed of two basic units: the scanner and the color optics and video amplifiers.

The new TA-188-A scanner unit contains the cathode-ray tube, scanning generator and high voltage supply, and an optically precise front-surface mirror for reflecting light from the cathode-ray tube to the slide unit.

The tube has a high-quality neutral density faceplate having 66 per cent transmission. The grey faceplate greatly improves small area contrast and increases "crispness" of the picture by reducing halation. The flying-spot scanning tube is positioned vertically. The mirror which directs the light is placed above the tube face.

The extremely small spot traces an unmodulated raster of high light intensity on the face of the cathode-ray tube. Light from this raster is directed to the front surface mirror and reflected to the slide changer section where it is focused through a lens system onto a 2-by-2 inch color transparency.

This light is transmitted through the transparency and is analyzed into its three component colors — red, green, and blue — by dichroic (color selective) mirrors.

The light, after passing through the color filters, falls on three individual multiplier phototubes, one for each of the primary channels. The signals generated by the multiplier phototubes are then passed through three phosphor persistence and gamma correction amplifiers, one for each color. Three simultaneous signals are thus obtained which then may be encoded according to National Television System Committee transmission specifications by the auxiliary equipment used by the manufacturer or broadcaster.

TAPE AND TV

According to the Industrial Bulletin of Arthur D. Little, Inc., a recent demonstration of television from a magnetic recording may open a new era for an old invention.

When recording sound on magnetic tape, the speed of the tape past the

electromagnet is closely related to the frequency or pitch that can be recorded. In general, the higher the tape speed, the higher the frequency which can be produced.

To record the vast amount of information presented on a television screen requires a bandwidth of four million cycles. Each dot on the viewing screen surface is a piece of information and must be translated into a magnetic impression on the tape. When, in addition, each dot may represent one of the primary colors, as in color television, the four megacycle bandwidth, or one almost as good, must be recorded three times. For this, the tape speed must be increased, and to avoid handling astronomical quantities of tape, it is necessary to record information on multiple channels which include a synchronizing signal to coordinate the successive pieces of information.

The recent color television recording and broadcast used five parallel recording channels on a single half-inch wide plastic tape, traveling at 360 inches per second.

There is a channel for each of the three primary colors, one for the synchronizing signal, and one for sound. Each channel can handle up to three million cycles. For black and white TV, the system would use two channels on quarter-inch tape. Reels 17 inches in diameter contain enough recorded information for five minutes of television program.

In the future, closer spacing and other techniques may permit slowing the tape travel to 240 inches per second, and a 15-minute program could be contained in a 19-inch reel, which would, however, contain three and a half miles of tape.

While the initial cost of tape is more than that of moving-picture film, the over-all cost is less, since film processing is eliminated and the tape can be erased and used again.

The great quantities of tape which would be required for television recording hold obvious promise for the manufacturers, and imply that tape is well on the way to becoming one of the major media for communication of information.

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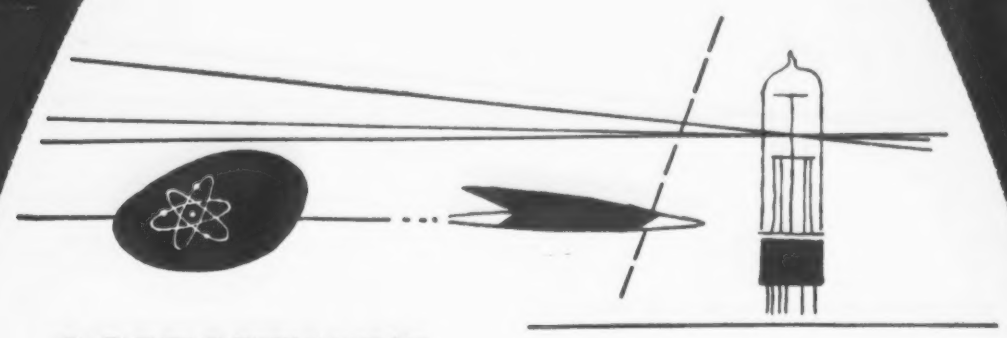
See pages 33, 34, 35 & 36 for details.



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BALTIMORE DIVISIONS

TELEVISION

Sanguinometer Uses Television And Computer for Blood Counting

By turning the television camera into the eye of a simple and ingenious computer, microscopic particles such as blood cells, bacterial cultures or grains of photographic emulsion can be electronically counted.

The system, known in its laboratory stage as the Sanguinometer, was developed by a team of electronics engineers at the David Sarnoff Research Center of RCA in Princeton, New Jersey, working in cooperation with the Sloan-Kettering Institute.

The equipment was devised to provide a simple, rapid and accurate mass method of taking blood counts to detect the first signs of radiation sickness among persons in the target area of an atomic bomb.

In addition to this emergency use, its application is foreseen in hospitals and research centers as performing almost instantaneously and with a minimum of error a process that has long been a laborious and time-consuming operation.

The Sanguinometer is essentially a closed-circuit industrial TV system combined with a novel computer. This computer has the ability to make a count of particles in a given field by means of a unique electronic circuit, developed in RCA laboratories.

The television camera, substituting for the eye of the observer at the eyepiece of the microscope, feeds the information which it "sees" to both the computer and a monitor viewing screen used in the developmental version to help in focus and illumination of the microscopic specimen.

The entire process is both simple and far more rapid than any manual count. Once the slide is prepared and put under the microscope, the operator manipulates a single control knob on the counting meter until an electric eye tube on the meter is closed. This indicates that compensation has been made for the average diameter of the particles to be counted. It is then necessary for the operator only to read the meter to determine the number of particles in the field of the microscope.

The Sanguinometer has indicated in tests that it is capable of handling with only a small margin of error a count of many varieties of microscopic particles as long as the particles within any one specimen are nearly uniform in size. It is not suitable for counting particles whose sizes and shapes vary widely in a single specimen.

RCA Holds Local Color TV Clinics for Technicians

A nationwide series of technical clinics on installation and maintenance of color television receivers was started in mid-February for TV servicemen across the country.

The clinics will be presented by the Radio Corporation of America for the servicemen-dealer customers of RCA Tube and RCA Victor Home Instrument distributors, and conducted by specialists of the RCA Service Company. The two-day seminars were launched simultaneously in 15 cities, and will be followed by similar clinics in many major cities during 1954.

The 15 cities are New York, New Haven, Newark, Philadelphia, Pittsburgh, Washington, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, Des Moines, Denver, San Francisco, and Los Angeles.

The color TV seminars are sponsored in the public interest by the Radio Corporation of America and its distributors to provide local servicemen with advance information on technical aspects of color TV service before color receivers become generally available to the public.

Technical specialists of the RCA Service Company who conduct the clinics will use textbooks, test equipment, movies, film slides, and other instructional material developed for this purpose by the company.

Educational TV Program at Fort Monmouth

The Signal School at Fort Monmouth, which recently received an award from the New Jersey Science Teachers Association for excellence in the use of television for educational purposes, is going forward with a program for making TV part of the regular instruction program.

The school trains thousands of officers and men in all aspects of communications necessary for national defense.

A two-year experimental program in educational television was terminated at the Signal School in June. Work is now going forward on a central studio from which instruction programs can be carried by cable to screens in theaters and to outlets within the school. The theater installation will consist of TV equipment which will project images onto theater-size viewing screens.

The two-year program indicated the value of TV for particular purposes. One of the striking features is the TV magnification of small electronic components which students must study in their courses. Not only are the objects more clearly seen, but large numbers of students can view them at one time.

The experiments also made evident a fact that TV educators in general have pointed out: an outstanding instructor with specialized knowledge and high teaching ability can appear before a vastly larger number of students than is otherwise possible.

While stating that they are convinced of the values of TV in education, the Signal School authorities point out that this technique should be kept in perspective. It should be used only in those situations where it has genuine value. The qualified teacher or instructor remains indispensable.

INDUSTRIAL TV USED BY NEW YORK POLICE TO BRING "LINE-UP" TO DETECTIVES

A new use of television which would increase the efficiency of law enforcement and save large-city police departments thousands of man-hours every year was demonstrated recently by the New York City Police Department and the Radio Corporation of America.

Using a small RCA industrial television camera and a microwave radio link, the police transmitted images of the daily "line-up" of suspects from the Police Headquarters in lower Manhattan, where the "line-up" is conducted, to the department's Brooklyn headquarters, about seven miles away.

At the Brooklyn end, a large group of detectives and police officials witnessed the line-up on the screens of modified RCA table model TV receivers.

Receivers installed in the line-up room enabled these officials and the RCA Service Company technicians manning the equipment to monitor the reception.

If adopted and supplemented by installation of receivers at all precinct police stations, such a system would make it unnecessary for hundreds of New York detectives to leave their precincts to go to headquarters to view the line-up.

The system could also be used for communicating photographs of wanted or missing persons and other pictorial information to any or all precinct stations. It would also enable police officials to address the entire

force simultaneously with any message of great importance.

In other fields, these closed circuits or "private wire" TV systems, now available for a few thousand dollars, are being used to facilitate control of the flow of materials and monitor dangerous, remote, or inaccessible processes in utility power plants, mills, and factories.

Closed circuit systems are also being used to enable large groups of students in schools and colleges to obtain simultaneous close-up views of such educational materials and demonstrations as microscope slides and surgical operations.

Several leading banks are using or planning to use such systems to enable tellers to quickly check signature cards, balance sheets, and other records in remote sections or other buildings. Small television cameras are also being used to guard entrances and exits of factories, laboratories, and other establishments.

The equipment used in the recent demonstration in New York was RCA's Type ITV-5 system, heart of which is the cigar-size RCA Vidicon camera pick-up tube. Signals are carried by microwave from an antenna on the Manhattan headquarters building to the Empire State Building antenna, where they were boosted in power and retransmitted to a receiving microwave antenna on the Brooklyn headquarters building.

Westinghouse Develops New Line of 90-Degree Deflection TV Tubes

A new line of 21-inch Reliatron television picture tubes is available from the Westinghouse Electric Corporation.

The new tubes are three inches shorter than previous 21-inch models, yet the viewing area has been increased about 5 per cent. The electrostatic types also contain the new Westinghouse gun (FM-44), which is capable of producing a sharper picture despite an increased deflection angle of 90 degrees.

Four new tubes are available in this new line. All are directly-viewed picture tubes of rectangular glass construction, with a nominal screen diagonal of 21 inches. The 21ALP4 and 21ALP4A are electrostatic focus tubes; the 21ALP4A is aluminized. Both tubes have external conductive coating.

The 21AMP4 and 21AMP4A are magnetic focus tubes. Both tubes have external conductive coatings and the 21AMP4A is aluminized.

SAR PULSESCOPE

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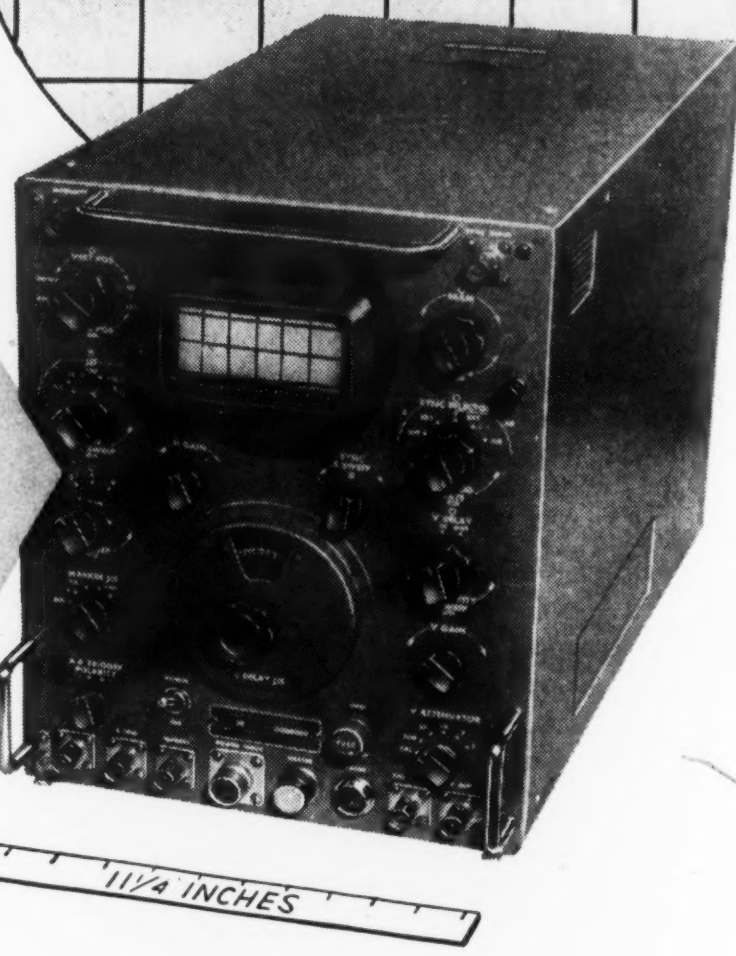

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Radio Military Amateurs

Edison Radio Amateur Award Winner For 1953 Named

A 46-year-old short-wave radio "mailman" who is the only regular communications link with home for hundreds of servicemen at Artic weather stations has been named as the top-ranking "ham" radio operator of 1953.

He is J. Stan Surber of Peru, Indiana, who received the General Electric Tube Department's Edison Radio Amateur Award for the outstanding "ham" public service of the year.

Surber, a Chesapeake and Ohio railway dispatcher, has handled over 18,000 messages to the far north since he started his "radio mailman" hobby in late 1950.

Last year, he transmitted and received over a million and a half words in Morse code to and from such points as T-3 an ice island near the North Pole. Messages go between servicemen's relatives and Surber by mail.

In one case, an American foreign service officer in Rome, Italy, mailed a birthday message to Surber to forward to his son. The father received his son's acknowledgement seven days later.

Some of the far-northern stations receive mail only once or twice a year. Over military radio channels, they were allowed 200 words per month. One returned Air Force sergeant wrote that messages through W9NZZ, Surber's station, came to him 30 hours after being mailed from home.

Surber relays the messages with no compensation. He works at his railroad dispatcher's duties from four p. m. to midnight, and usually is at his short-wave set from 7:30 a. m. until just before leaving for his work.

Formal presentation of the Edison Award was made in February, in Washington, D. C.

Maryland Amateur First To Join Army Radio Training Program

Charles B. Weaver, 17, of Chevy Chase, Maryland, is the first civilian to be approved for membership in the Military Affiliate Radio System under the new age requirement rules.

On November 26, 1953, the age requirement for non-military applicants to MARS was lowered from 21 to 16 years. (See article in January-February 1954 SIGNAL.) Members of the Armed Services, ROTC, National Guard or one of the Reserve programs have always been eligible, regardless of age.

Weaver, a high school senior, holds a general class amateur radio license issued by the Federal Communications Commission. He is a member of his school electronics club and belongs to the American Radio Relay League. He operates amateur radio station W3VAR from his home. His military call letters will be A3VAR.

As a member of MARS, he will receive specialized training in military radio communications. From his home station he will participate in scheduled radio net drills, learning joint Army-Navy-Air Force procedures. He will be taught radio net discipline and security precautions. Supervising his training will be Colonel E. S. Van Deusen (A3ECP), USA, ret., Army MARS Director for Maryland.

Expansion of MARS to include younger amateurs is expected to provide direct benefits to scientific and technical-minded young men who may be called into military service, by giving them a better understanding of military communications.

Mars Stations Participate In Operation Tobacco Leaf III

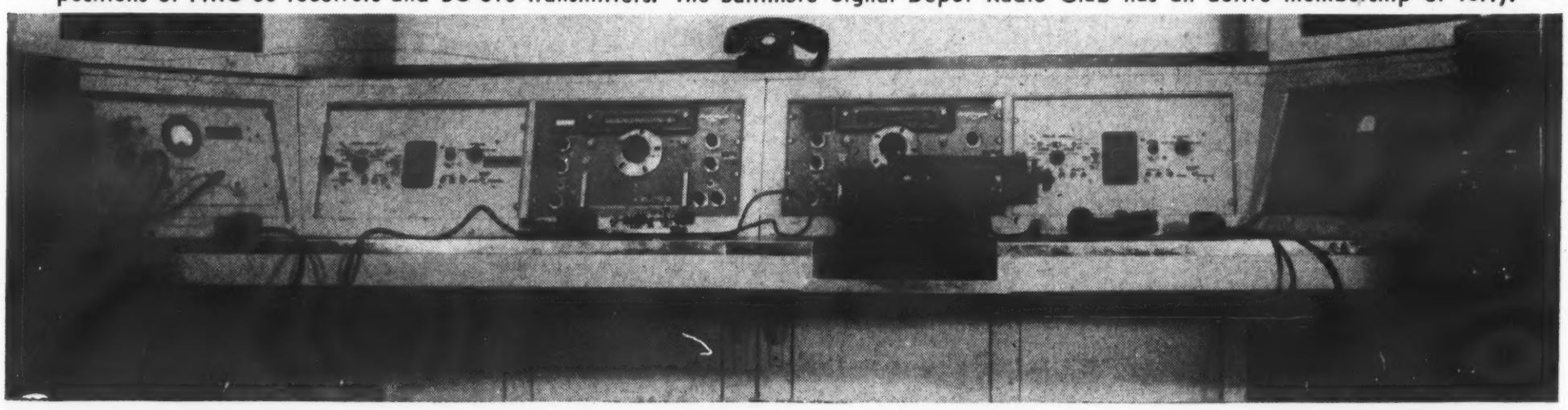
The value of the Military Affiliate Radio System as an alternate means of communication was demonstrated recently in connection with Second Army's Exercise OPERATION TOBACCO LEAF III.

The Exercise was a 24-hour problem involving "enemy" forces in the State of Pennsylvania. The maneuver utilized headquarters personnel and units in the seven state area which comprises Second Army.

MARS nets were an Eastern Underground Net and Western Underground Net; both operated on CW. An Interceptor Net, a Civilian Affairs Net and an Enemy Net operated on phone. All nets were alerted at 1100 hours, one hour before the Exercise officially started.

• All stations used tactical call signs and operated in accordance with a special SOI (Signal Operation Instruction). For many of the stations it was the first time they had participated in a full military net. Despite occasional interference and atmos-

Pictured below is MARS Station A3PGO, Baltimore Signal Depot, located at Fort Holabird, Maryland. Station facilities include dual operating positions of HRO-50 receivers and BC-610 transmitters. The Baltimore Signal Depot Radio Club has an active membership of forty.



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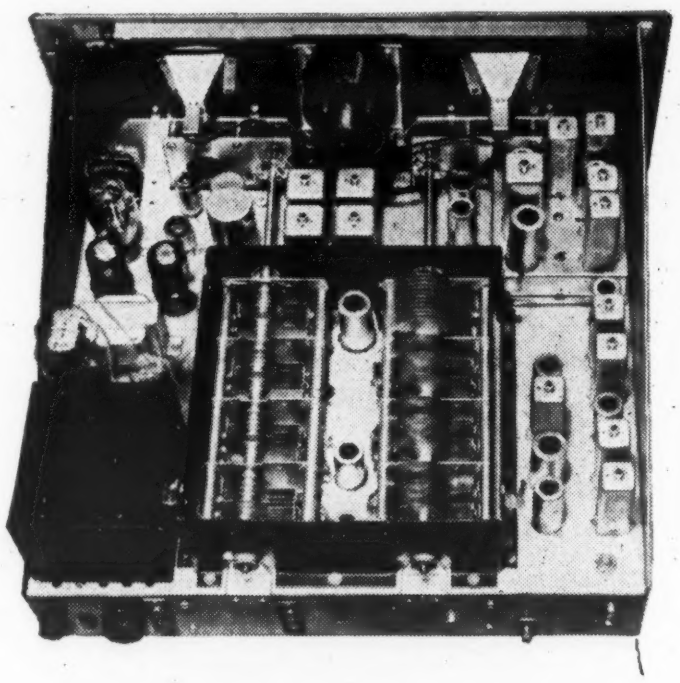

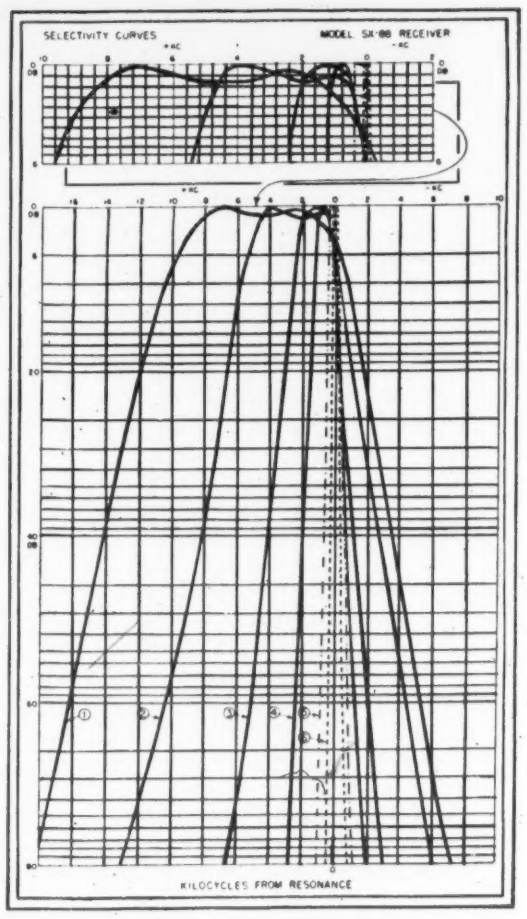

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16. Tuning dial indicators resetable from front panel for maximum calibration accuracy.
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20. Dual S meter calibration S units and microvolts.
21. Auxiliary power socket plus .6 amps at 6.3 volts and 10 ma at 150 volts for accessories.
22. Standard 8¾" by 19" panel for rack mounting if desired.
23. 50 kc i.f. output jack via cathode follower for teletype converter, etc.
24. Five position response control (tone control).
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29. Audio output transformer for 3.2, 8, 500/600 ohm loads.
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31. Auxiliary sensitivity control permits monitoring of local transmissions in standby position.

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pherics during the night, alternate routing and efficient operator techniques kept the flow of traffic constant. Staffs at Fort Meade, Maryland and Fort Knox, Kentucky received the traffic and were able, by means of master schedule, to check all copies of messages, routings and transmission times.

One hundred stations participated in the Exercise. Active duty military personnel manned the stations at Fort Meade and Fort Knox. An estimated 11,300 groups were transmitted during the Exercise.

Raytheon Introduces "COZI", New Radar Device

Raytheon Manufacturing Company, of Waltham, Massachusetts, announced recently that military secrecy has been lifted from the new device, "COZI", which was developed by that firm in cooperation with the U. S. Air Force.

"COZI" ("Communications Zone Indicator"), makes it possible to tell whether broadcasts from international shortwave broadcasts or any other long-range transmitters are successfully reaching their destinations, indicates approximately how strong the broadcast signals are when they get there, and may show whether the enemy is deliberately "jamming" that particular frequency with static and interference.

The Air Force is expected to make extensive use of COZI to increase the efficiency and reliability of its worldwide communications system.

To test a radio signal, COZI sends out a radar beam from the station's own antenna. The beam follows the same path taken by the radio waves. The difference, however, is that the COZI beam comes back and tells where it has been, and often, whether it has run into any interference at its destination.

Radio beams literally skip along by bouncing from earth to sky and back to earth. The peculiar ionized layers of atmosphere lying far above the stratosphere reflect radio beams back to earth.

After leaving the transmitter, the beam travels straight outward until it reaches the deflecting layer. There it is deflected downward and returns to the earth a great distance away. The distance from the transmitter to the area where it comes down to the earth again is known as the "skip distance".

For each skip distance, which varies with the transmitter frequency being used, there is an area of silence, where the radio signal cannot be received. The skip distance must be adjusted by proper choice of transmitting frequency to make sure that the broadcast will come down out of the sky into the area where the listeners are located.

The skip distance is determined by two factors: the frequency on which the transmitter works, and the condition of the reflecting sky layers. The latter is a variable which offers the greatest difficulty, for it changes during certain seasons of the year, and also changes during the time of day.

These regular changes can be predicated with fair accuracy — but unfortunately, there are other, unpredictable changes wrought by sun spots and other atmospheric disturbances.

Radio "hams" and others who are terested in extremely long-range transmission use a set of monthly predictions published by the Central Radio Propagation Laboratory. These predictions tell which frequencies are most likely to give good results for given times of day and month, but at best, it is a matter of guesswork.

With the use of COZI, however, it is possible to know instantly and accurately whether a given frequency is being reflected at the proper skip distance to reach its destination.

COZI is made in two units, each about as big as a steamer trunk. One is the transmitter, the other is the receiver. To test a radio station, it is necessary to interrupt the broadcast momentarily while the radar beam is sent out. A reading is obtained instantly, and broadcasting is resumed without any appreciable break or loss of time.

SINGLE SIDEBAND TESTS BY FIRST ARMY MARS MEMBER

Morton B. Kahn, A2KR of Great Neck, N. Y., has conducted a series of tests on single sideband (SSB) on the MARS frequency 4025 kilocycies.

A2KR used a Central Electronics single sideband Multiphase Exciter model 10A feeding a Temco one kilowatt linear amplifier. The antenna was a half-wave 75 meter dipole fed by RG-11/U 72 ohm coax.

The transmitter was capable of either AM or SSB transmission with variable power input. The AM signal was used for comparison purposes and for explaining how to tune various types of receivers for proper reception of SSB signals.

A2USA called the First Army Free Net to order at 1100 EST. After 17 stations had reported in, the net was turned over to A2KR. Tests were conducted on both AM and SSB with input powers of 1000, 500, 250 and 25 watts in that order.

The net members reported back with enthusiastic comments. There was little difference in the received signal with any of the input powers on SSB. It was noted that the receiver BFO must be stable for good SSB reception, and the SSB signal appeared to be extremely wide unless the correct procedure of AVC off, RF gain low, AF gain maximum, was used. When these conditions were met the SSB signals appeared sharp, and occupied half the frequency spectrum that a comparable AM signal occupied. SSB signals were received under QRM and QRN conditions that made AM signals unreadable.

The tests created great interest in SSB. Members of the MARS net have asked for more extensive tests and comparisons to be made in the future.

The majority of MARS (Army) frequencies are not cleared for SSB transmissions. Future plans call for extensive use of SSB throughout MARS. Tests transmissions between WAR, Washington, D. C. and A5USA, Fort Sam Houston, Texas are planned when installation of the equipment is completed.

NAVY MATS HAWAII AMATEUR RADIO CLUB

The Navy MATS Hawaii Amateur Radio Club, formerly the Air Transport Squadron Eighth Amateur Radio Club, was organized during September 1952 to promote and encourage amateur radio activity among MATS personnel. The club is composed of twenty-seven members, sixteen of whom hold FCC amateur licenses. Officers of the club are: Mr. Chuck Shaw (W5TEN), president; Mr. Gus Schappals (W1QHV), vice president; Mr. Gene Harris (KH6ASO) secretary.

In addition to the club's officers, some of the more active members are: Dick Hughes (KH6ARE), Bill Miller (KH6ASA), J. W. Joice (KH6AVE), Don Stansbury (KH6AVQ), Al Gaurdy (KH6AWK), Kenneth Wackford (W6BID), George Allen (W6NGD), Jim Morgan (W6YQL), Bob Baldwin (W6ZMQ), James Hauser (W8QYF), G. J. Pinz (W9GEF), Bud Gowker (W9UOC), and Owen Hodgell. Associate members are: B. M. Strean, R. K. Hender-

son, N. Ortiz, G. H. Lane, C. D. Hubbard, H. Sexton, G. M. Stimmel, J. D. Apling, P. J. Bloom, J. M. Diez, L. M. Ivarson.

Club equipment consists of a custom built 500 watt transmitter with a modified ARC-5 serving as external VFO. A Hammarlund HQ-129X is used for receiving. At present the station operates on the 20 meter phone band only, using a pair of 813's, running 450 watts input. Antenna consists of a three element beam designed for 10 and 20 meters. The station call is KH6QU.

In addition to encouraging amateur radio activities by the members, the club makes its facilities available to transient personnel for the exchange of messages with other amateurs.

Three associate members of the club expect to qualify for their general class amateur operator license in the near future. W5TEN, KH6ASA, KH6AVQ, KH6AWK, and three associate members are building their own personal rigs. The other members are rag-chewers and traffic handlers.

The club has made itself well known from Toyko to New York, and Alaska to Australia, putting out a signal comparable to kilowatt rigs in the area.

New 1-KW Baluns Announced By B & W

Many of the problems involved in matching feed line systems of radio transmitters to either rotary or fixed antennas are solved by a new line of 1-KW Baluns announced recently by Barker & Williamson, Inc.

Three of these new Baluns have been designed for use with beam antennas employing the popular "T" matching section. Available in models for either 20, 15, or 10 meter operation, their input is designed to match a 75 ohm unbalanced feed line system while the output, in combination connection with a "T" section, matches 100 ohms. Made to fit in with virtually all rotary beam antennas, they take the guess work out of impedance matching problems between an unbalanced power source and a balanced load (driven element).

The remaining Baluns are for use with half-wave, folded dipole antennas. Designed for an input of 75 ohms balanced, a total of 5 models are available for operation on the amateur bands 80, 40, 20, 15, or 10 meters.

Both basic types require no tuning except normal adjustment to the "T" match section. Each is fitted with a coaxial input connector and two ceramic feedthru output terminals.

These new Baluns fill a long-vacant gap in the continual effort to acquire maximum power in the antenna, minimum SWR, high signal-to-noise-ratio, and low line radiation.

Don't forget!
the AFCA 8th Annual CONVENTION
See Pages 33, 34, 35 & 36

Colonel Larew Named to Mars Advisory Committee

Colonel Walter B. Larew, USA, Chief of Army Communications Service Division, Office of the Chief Signal Officer, has been appointed to serve on the Military Affiliate Radio System (MARS) Advisory Committee. He replaces Colonel William D. Hamlin who is presently on duty in the office of the Secretary of Defense.

The committee meets at Washington quarterly to advise the Chief Signal Officer, USA, and the Director of Communications, USAF, on MARS operations and to make policy recommendations for coordination of military and civilian amateur radio activities.

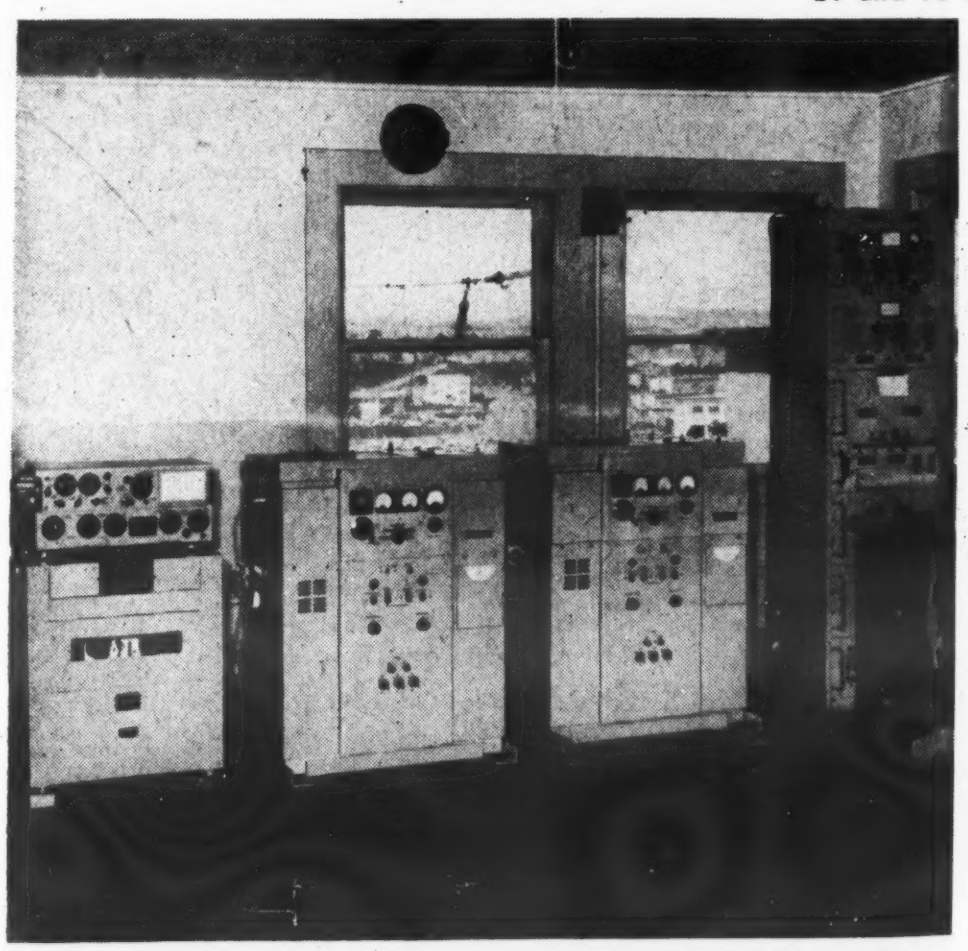
New Amateur Transmitter By Barker & Williamson

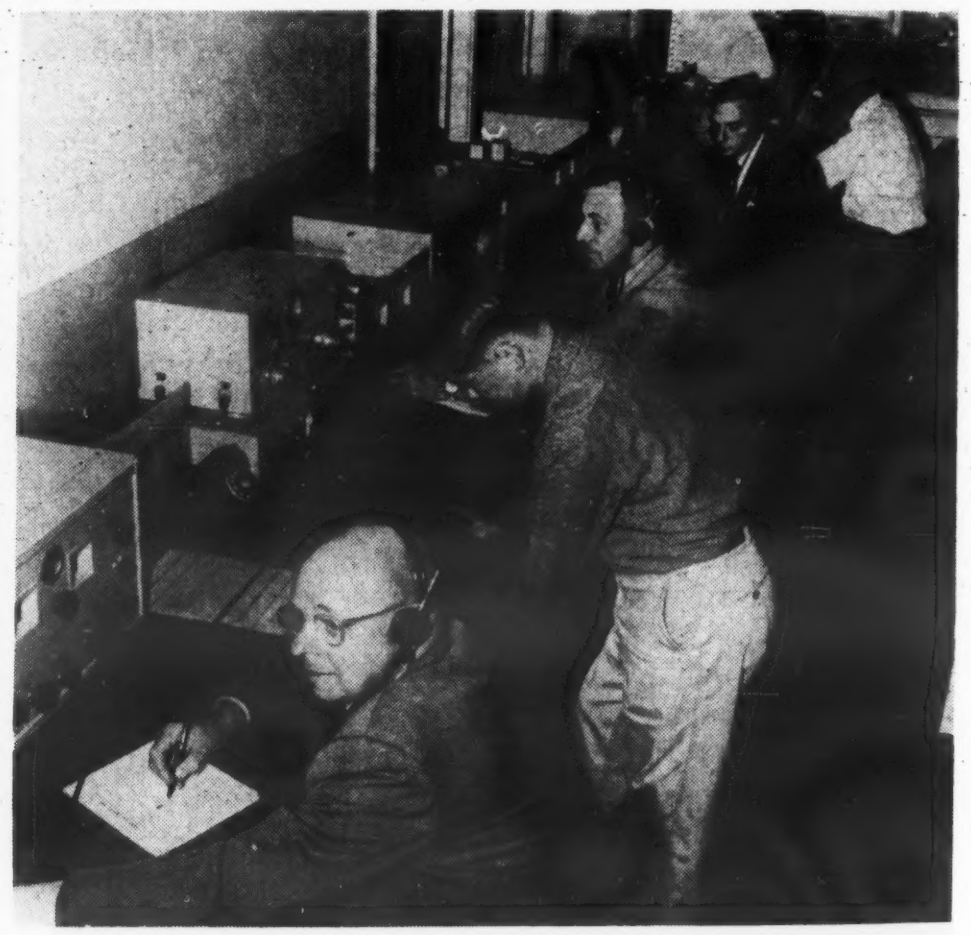
A new, medium-power amateur transmitter featuring VFO or crystal operation on six amateur bands has been announced recently by Barker & Williamson, Inc.

Housed in a table-top cabinet, the new B&W Model 5100 Transmitter provides input powers of 150 watts CW, and 135 watts phone.

Either VFO or crystal control may be selected for any amateur band—80, 40, 20, 15, 11, or 10 meters. The frequency of output is read directly on the face of an easily read slide rule dial, accurately calibrated for each band. Excellent VFO stability is achieved through careful design.

The transmitter section of the San Francisco Naval Shipyard Amateur Radio Club is shown at left. On the right is shown the receiving section. Left to right, Clyde Dick (W6CHP) operating 2 meters, Bob Lee (W6ZHO) standing, routing traffic, Al Weber, monitoring 20 meter CW, Bill Green (W6BYS) operating 40 meter CW, Roy Jeter, assisting with logs and traffic, and Gunner Ahlstrom (W6JQJ) operating 20 and 75 meter phone.





PHOTOGRAPHY

ELECTROPHOTOGRAPHY: A NEW PHOTOGRAPHIC PROCESS

Norman C. Lipton, writing in the February 1954 issue of *Photography*, describes and discusses the dramatic progress made in the recent past toward the perfection of a new photographic process known as "electrophotography", a continuous-tone version of xerography.

Continuing, Lipton states that, thanks to intensive development work initiated by the U. S. Army Signal Corps Engineering Laboratories at Fort Monmouth, N. J., portraits and landscapes of excellent photographic quality can be turned out by this method. Whereas the speed of the original xerographic plate, introduced in 1948, was about equal to that of a chlorobromide enlarging paper with an exposure index of 0.3, the Signal Corps is now working with a material that is as fast as Kodak Plus-X film (ASA 50).

The color sensitivity of the original xerographic plate had been restricted to the blue-violet end of the spectrum while the latest plate has a fully panchromatic response extending through the entire visible spectrum. Previously, the processing of the exposed electrophotographic plate used to take several minutes; development of the image now takes just one second. Basic mechanism of the xerographic or original process is that a reusable light-sensitive metal plate which can be exposed in any ordinary camera, is sensitized before use by means of a corona discharge, which positively charges its entire surface. When the plate is subsequently exposed to light, areas of it lose this positive charge in proportion to the intensity of the exposing light. The plate is then developed in a cloud of finely divided carbon producing an inexpensive dry picture with a resolution of more than 56 lines per millimeter on the taking plate. The parent process, xerography, is the invention of Chester F. Carlson, a New York patent attorney and is covered by the following basic patents. 2,297,691; 2,221,-776 and 2,357,809.

Lipton states that the Signal Corps now feels that recent improvements in the process warrant the development of operating equipment. Continuing, Mr. Lipton says that, according to the opinion of Mr. Steven Levinos, Chief of the Chemical and Methods Section, Photographic Branch, under whose supervision the work was done, within 5 years electrophotographic equipment will be available on the civilian market, but principally for scientific work and commercial reproduction.

CAMERA COMBINES PHYSICS AND ELECTRONICS

Hycon Mfg. Company, producer of photograhic and electronic equipment, has begun production of one of the world's fastest electronic cameras. The new camera can take a picture in only one-tenth of one-millionth of one second. Its speed is so great that it can photographically chop a beam of light into separate segments. Known as the Hycon Submicrosecond Camera, the first instrument was developed under contract with and has been put to work by the Ballistics Research Section of the Aberdeen Proving Grounds.

The camera combines the sciences of physics and electronics. A Kerr cell of unique design acts as the shutter. The cell consists of two screens of polarized material separated by a solution of nitrobenzene. An electronic device applies a high electrical potential across the cell. The shutter holds out light until the electrical charge realigns the molecules of nitrobenzene, thus permitting light to pass through the cell and onto the film. There are no moving parts, and the electrical power to take the picture is no more than that required to light a Christmas Tree bulb.

The new Hycon camera has been found to have a number of previously unanticipated uses in the study of industrial processes, such as the observation of jet engine combustion.

New Super-Cinephor Projection Lens

Bausch & Lomb Co. have announced a new series of f/1.8 Super-Cinephor projection lenses which were developed to produce maximum brightness, contrast and sharpness, edge-to-edge, on all types of professional screens. The new lenses were developed by the company engineers specifically to solve the problem of resolution at the outer edges of the screen and to increase the illumination, distributing it equally.

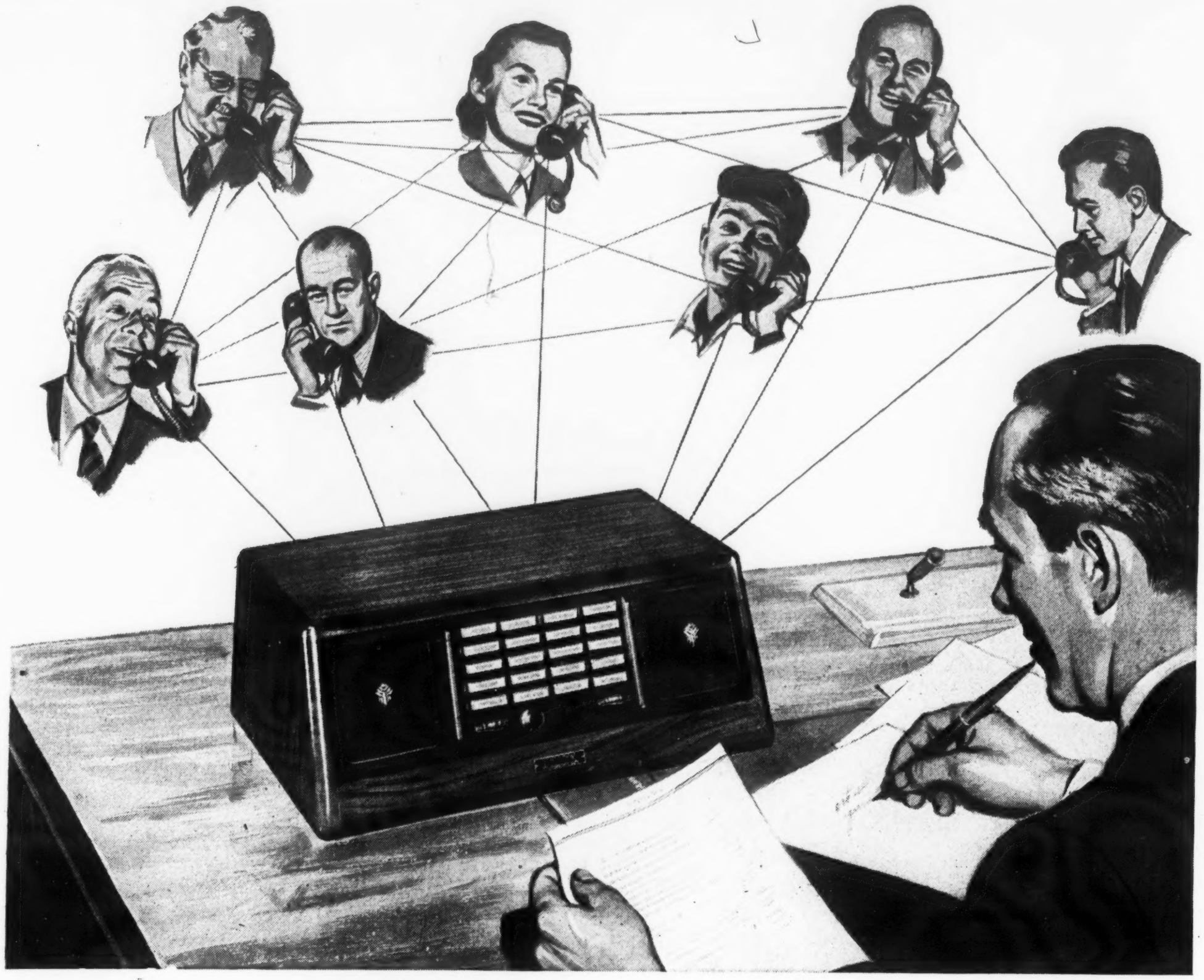
The lenses, which are the result of five years of research and development by the company, employ five different kinds of glass, two of which are varieties of extra dense barium crown glass, only recently perfected on a production basis by Bausch & Lomb. Tests made by the company indicate that the new lenses will greatly enhance projection on regular 2-D screens and also on the new types of Cinemascope, and other wide screen processes, and 3-D. The lenses are available in a wide range of focal lengths.

Wide Screen for 16 mm. Presentation

Radiant Manufacturing Corp., of Illinois, have announced development and availability of a new portable curved screen, the "Curvex", specially designed for wide screen 16mm presentations. The new screen is available in widths ranging from 5 to 20 feet and is made of a highly reflective silver fabric. It is 2½ times as wide as it is high and is attached to an aluminum framework which holds the screen in a curve to conform with the requirements for most wide-screen projection systems such as the Bell & Howell Co. 16mm anamorphic lens system for projection. The curved surface of the screen is claimed to give an excellent illusion of depth and also gives more equal distribution of the reflected light. The metallic surface of the screen makes it ideal for straight 3-D projection also. The screen may be quickly set up and dismantled and the fabric rolled up and placed together with the light weight frame into a compact metal case for carrying.

New Rush Synchro-Shutter Tester

The Rush Instrument Co., Inc., of New York City, recently announced a new electronically operated instrument for measuring shutter and synchronization delay for both between-the-lens and focal plane camera shutters. Known as the Rush Synchro-Shutter Tester, the instrument measures shutter speeds over the entire range between 1 millisecond and 1 second. Synchronization is measured from "X" (Zero delay) to 1000 mil-



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SELECT-O-PHONE is a product of Kellogg Switchboard and Supply Company, a Division of International Telephone and Telegraph Corporation. It's another example of the leadership in research and engineering, resources and facilities of IT&T and its manufacturing associates.

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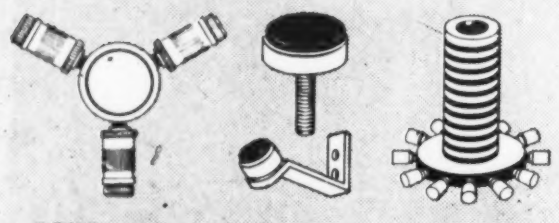

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liseconds. A calibration circuit is included in the tester so that the operator is sure of accuracy at all times. In addition, the tester will verify the condition of 1½ volt to 22½ volt batteries and ascertain circuit continuity in synchronization cords. The principle of operation of the tester is based on condenser charging and in operation, the camera or shutter to be tested is placed between a lamp and a photo-electric cell. When the shutter is actuated, the tester measures the length of time that the light penetrates the shutter. The manufacturers state that the tester is simple, basically foolproof and is specially designed for camera repairman, camera designers and manufacturers.

Levinos Appointed Chief of Photographic Branch at Ft. Monmouth

Stevens Levinos, formerly Chief of the Chemical and Methods Section, Photographic Branch, Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey, has been appointed Chief of the Photographic Branch.

Mr. Levinos was formerly employed as a chemist with the National Bureau of Standards in Washington, D. C., and is Engineering Vice President of the Society of Photographic Engineers. He brings to his new position a long and varied experience in research and development in the fields of chemistry, particularly as applied to photography and photographic engineering.

American Society of Photogrammetry Holds 20th Annual Meeting

More than 1,000 photogrammetrists, those who use aerial photographs for making maps, recently gathered in Washington, D. C., during January, for the 20th Annual Meeting of the American Society of Photogrammetry.

The opening address of the meeting was given by Under Secretary of the Interior, Ralph A. Tudor, who spoke on "Photogrammetry in Resource Development".

Dr. Francis E. Washer, of the National Bureau of Standards, spoke on "Sources of Error in Camera Calibration", analyzing the probable error in measuring distortion, and tracing the history of efforts to reduce distortion, and other sources of errors in calibrating cameras.

"Interpretation of Radar Scope Photographs" was discussed by Miss Pamela Hoffman of the U. S. Aeronautical Chart and Information Center. She described the development of procedures for examining images on radar scope photographs and outlined methods for determining the nature and significance of objects which cause these images to appear on the radar scope. Successful interpretation, she stated, depends upon a large number of photos taken under a wide range of conditions.

William T. Walsh, Jr., of the U. S. Library of Congress, spoke on "Aerial Photography in Civil Defense". He reported that aerial photos are being relied upon very heavily by the Federal Civil Defense Administration in marshalling forces to counteract a possible large-scale, devasting attack on this country by a potential enemy. He analyzed pre-attack vulnerability and assessed possible bomb damage. He concluded his talk by asserting that one single aerial photo reveals innumerable items of information that are of importance to defense.

Society of Photographic Engineers To Hold 4th Annual Conference

The Society of Photographic Engineers will hold their Fourth Annual Conference at the Hotel Thayer, West Point, N. Y., on May 26th, 27th, and 28th, 1954.

The Conference will cover the following subjects in the field of Photographic Engineering: photographic instrumentation, photographic apparatus, photographic optics, the photographic process and apparatus for evaluating photographic materials and their performance.

• Technical papers to be presented at this conference will deal with the many scientific and engineering aspects of photography and its applications and will prove of particular interest to those in photographic engineering.

Papers presented at the Conference will be published in subsequent issues of the Society's official journal, *Photographic Engineering*. The deadline for manuscripts is April 1st. Additional details relative to the presentation of papers may be obtained from the Papers Program Chairman, Mr. Steven Levinos.

In addition to the comprehensive program which will include some thirty papers, a large and varied exhibit of the latest equipment in the field of Photographic Engineering is also planned.

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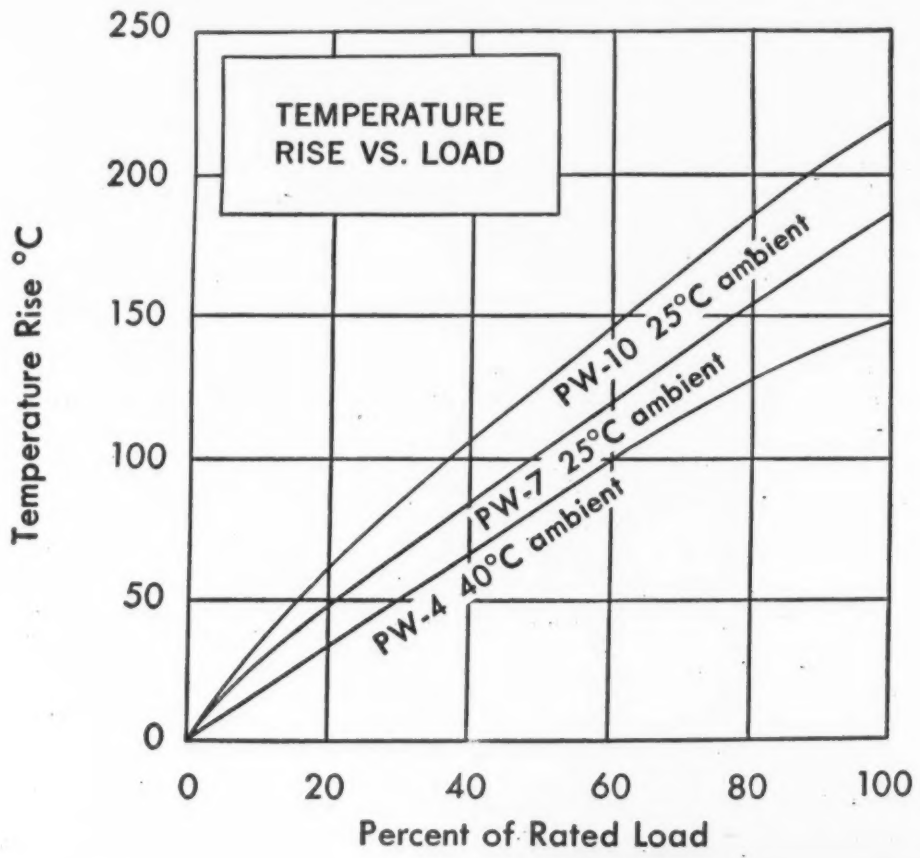

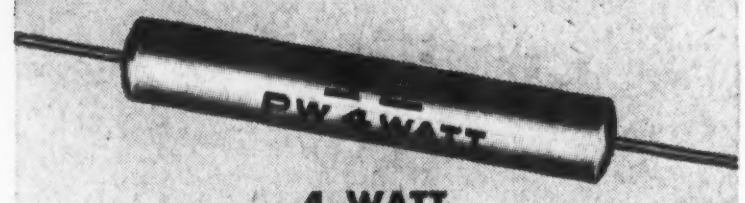

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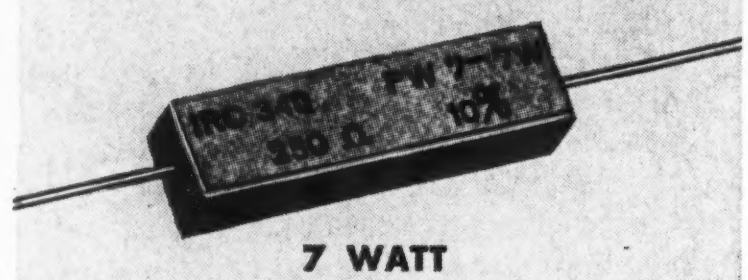

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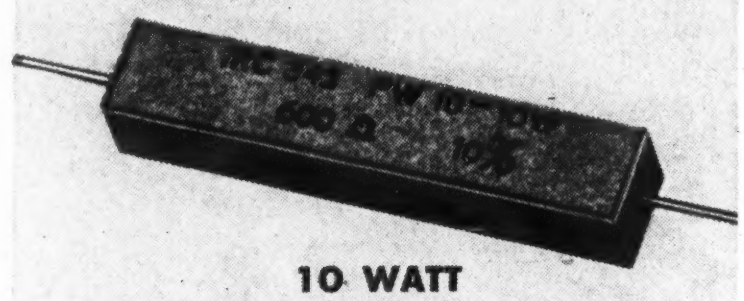

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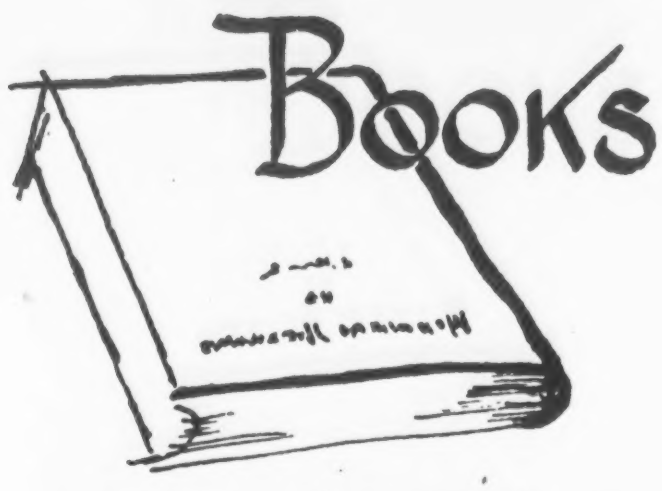

INTRODUCTORY CIRCUIT THEORY. By Ernst A. Guillemin. John Wiley & Sons, Inc., New York, N. Y. 550 pages, $8.50.

HERE, FROM A MODERN POINT of view, is an introductory treatment of all the basic principles and concepts needed for complete understanding of advanced work in network analysis and synthesis.

The book is designed to meet the needs of flexibility and nonconventionality set by recent trends in industrial and technological activities. It provides an indispensable introduction for anyone who plans a continued interest in any area in which electric circuits play a part.

Introductory Circuit Theory begins with first principles, then provides a coherent exposition of the methods of steady-state and transient circuit analysis, as well as giving the basic concepts essential to synthesis procedures.

Here are provided all of the tools and concepts, all of the graphical interpretations and computational aids that are essential to modern advanced research in network theory. It deals with the real tools of the trade.

LOGISTICAL SUPPORT OF THE ARMIES, Volume I. United States Army in World War II; European Theater of Operations. By R. G. Ruppenthal. Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 616 pages, $4.50.

Logistical Support of the Armies, one of the volumes published in the European subseries of the history, U. S. Army in World War II, tells the vital story of how the U. S. armies under General Eisenhower were built up in the United Kingdom for the great Normandy invasion of 1944 and how they were supplied during the first three months of operations on the continent.

More than a million and a half U. S. troops were crowding the United Kingdom as D Day approached, and more than two thousand ships formed the armada that bore them to the Normandy coast. This assault that stirred the world and was to culminate in the liberation of an entire continent, demanded prodigious feats of planning and organization.

It demanded skilled leadership, detailed coordination, and long hours of training and undertakings. *Logistical Support of the Armies* describes all these activities and more.

It points out the resentment harbored by the combat soldier against what he considered dereliction on the part of the rear-area soldier and the resulting friction that arose between the service forces and the field forces.

It analyzes the controversial role of General Lee, who not only commanded the Communications Zone in the European Theater of Operations, but acted as Deputy Theater Commander under General Eisenhower.

The volume covers the entire sweep of the lifeline that began in the factories and farms of the United States and ended in the foxholes of the infantrymen.

This book is the story of those supply lines under the stress of war, of how they were broken at times, of how they were put together again, and of how the brains and energies of many able men laid them out and kept them strong enough to win the victory.

MECHANICAL VIBRATION. By G. W. van Santen. Philips Technical Library, Elsevier Press, Inc., Houston, Texas. 308 pages, $7.50.

MOST OF THE VIBRATIONS occuring in the different branches of engineering are of a detrimental nature, being either unpleasant or actually dangerous. It is precisely for this reason, however, that a closer study of such effects, their elimination and also the present stage of research in this sphere is not only highly interesting, but very necessary.

The author discusses the theory involved in vibration phenomena in such a way that it can be readily assimilated by anyone having an ordinary knowledge of mathematics. The results of the computations are in every case presented in the form of tables or charts.

Mechanical Vibration is a guide to the solution of problems encountered in daily practices, in research and engineering laboratories, and will be welcomed by designers of machines, automobiles, aircraft, ships and all kinds of instruments.

THE QUARTERMASTER CORPS: ORGANIZATION, SUPPLY, AND SERVICES, Volume I. U. S. Army in World War II; The Technical Services, By Dr. Erna Risch. Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 418 pages, $3.25.

THIS VOLUME ON THE WARTIME operations of the Quartermaster Corps is another work prepared by the Office of the Chief of Military History, Department of the Army.

In her description of the Corps' manifold supply problems, the author, Dr. Erna Risch, has turned the spotlight on a phase of military history that until recently has been largely overlooked in favor of the more colorful and dramatic combat history.

The contribution of American industry in solving the many problems of supplying large bodies of troops in the field is fully covered. To fill the bewilderingly varied demands made on it, the Quartermaster Corps had to conduct its supply operations with swiftly changing techniques on a global scale. It had to modify established plans, improvise, and produce under pressure.

The volume gives students of military affairs some concept of the scope and complexity of the activity involved in equipping and maintaining troops in the field. It also serves to emphasize the need in time of peace for flexible and continuous supply planning and developmental work in military clothing, rations, and general equipment, as well as in the more dramatic weapons of war.

ELEMENTS OF ELECTRICAL ENGINEERING, 6th Edition. By Arthur L. Cook and Clifford C. Carr. John Wiley & Sons, Inc., New York, N. Y. 682 pages, $6.75.

FIRST PUBLISHED THIRTY YEARS AGO, *Elements of Electrical Engineering* has long since become a standard work. Successive revisions have kept it abreast of the field, but the authors have never lost sight of the original objective—a clear presentation of principles, in a manner that brings out the physical significance of the relations and does not depend merely upon mathematical derivations of formulae.

(*Continued on page 76*)

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"Gunner to Pilot . . . two fighters . . . turning in!"

No TIME to repeat this message. He must get every word right the first time.

In today's higher-speed, higher-altitude bombers, crewmen must quickly grasp every code-word passed. Speed of intercommunication has to keep pace with speed of operation.

Working since 1947, RCA engineers have developed the AN/AIC-10—an intercom system which meets Air Force requirements for high intelligibility under conditions of extreme noise and altitude. RCA noise-discriminating microphones have two faces which "balance out" extraneous noises, transmit sounds *only* from the speaker's mouth. Unique filter, amplifier and automatic volume control circuits reduce the effect of extraneous noise. Altitude-compensating headsets maintain sea-level sensitivity at 40,000 feet or more—and give crews maximum head comfort.

Now in full production, the AN/AIC-10 is but one of many complete electronic systems RCA has developed for the Armed Forces. RCA engineering —from original planning to final production— assures greater efficiency, effectiveness and safety in operation.

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BOOKS

More than half the book has been rewritten. The space devoted to electronics has been increased, resulting in a better balance between circuits, machines, and electronics.

The illustrations have been extensively revised and many new illustrations have been added. They bring the work completely up-to-date, and increase the clarity and effectiveness of the presentation.

New problems have been formulated to illustrate basic principles and to develop the student's ability.

Many of the changes in the sixth edition are based on the results of a nationwide survey undertaken to find in what ways the usefulness of the book could be increased.

INDUSTRIAL ELECTRONICS. By Dr. R. Kretzmann. Philips Technical Library, Elsevier Press, Inc., Houston, Texas. 250 pages, $5.50.

THIS BOOK HAS BEEN WRITTEN to present in a simple and practical way the general principles of electronics as applied to modern industry.

The first part of the book describes the principles and properties of the various classes of electronic tubes, together with typical applications and circuits. The treatment is simple and straightforward. The small amount of mathematics, which is introduced only where necessary, is of an elementary character.

In part two a separate chapter is devoted to each of the main types of application, such as electronic relays, counting circuits, etc. containing a large number of practical examples, the operation of each being described in considerable detail with fully designed circuits.

Industrial Electronics will be found invaluable to technicians engaged in the supervision or maintenance of industrial equipment, and to industrial engineers in the mechanical and electrical fields who desire to acquaint themselves with the possibilities of electronic control and its methods of application.

Handbooks of Interest

TRANSISTORS AND THEIR APPLICATIONS. Coyne Electrical School, Educational Book Publishing Division, Chicago, Ill. 103 pages, $1.50.

TV REPAIR TECHNIQUES. Gernsback Publications, Inc., New York, N. Y. 128 pages, $1.50.

GUIDE TO AUDIO REPRODUCTION. By David Fidelman. John F. Rider Publisher, Inc., New York, N. Y. 232 pages, $3.50.

Civil War Signals

(*Continued from page* 13)

Alleghenies and were extending westward under the Western Union Telegraph Company. To the facilities and the skilled operators of these companies the War Department turned for its telegraph communications. Thereupon the Military Telegraph took form in the hands of civilians. Throughout the war it was the firm policy of the War Department chiefs that both the telegraph facilities and their operators remain civilian, free from military constraint or Signal Corps control. The Secretary of War and the President himself placed great dependence upon the telegraph system which kept the seat of Government very well posted and by which the government sometimes interfered with campaigns in the distant field. A number of the top men in the military telegraph organization received army commissions. Their chief, Anson Stager, general superintendent of the Western Union, was made a Colonel. Such commissions were perfunctory in order to make it possible for the officials to receive and disburse funds and property under the quartermaster of the army.

During the first great battle of the Civil War at Bull Run the only communication system which succeeded in serving the Union army was the civilian telegraph. Civilian telegraphers accompanying the Union army into Virginia first opened up a telegraph office at Falls Church. Along the Orange and Alexandria Railroad they next opened the office at the Springfield Station on 19 July and offices at Fairfax Station and at Fairfax Courthouse on the 20th. The telegraph wires and their operators went no farther. All communications to and from the advancing Federals as they moved on to Centerville seven miles beyond were conveyed by mounted couriers. On the day of the battle, 21 July, the couriers raced messages every few minutes from McDowell's headquarters back to Fairfax Courthouse, where telegraphers put them on the wire to the War Department. Late in the afternoon, the telegrams describing the conflict suddenly conveyed news of defeat and rout. In the early morning hours of 22 July the civilian telegraphers closed the Courthouse station and withdrew with the retreating soldiery to Washington.

The Confederate Signal Corps, off to a good start at Bull Run, performed throughout the war duties in electric

(*Continued on page* 78, *col.* 1)

RCA Experiments Point to Possible Electronic Control Of Cars, Trucks

(*Continued from page* 25)

at specified cross-over points. In this case, the sequence of events as a car approaches another vehicle which is either stalled or moving at a lower speed is: As the signal picked up from the 'flying tail' of the preceding vehicle reaches a certain level, the guidance setting would be shifted to the left lane. Then, the car would pass over to the left lane at the next cross-over point and pass the slower vehicle unless:

a. The turn-off is blocked by signals from a nearby vehicle which is already in the left lane, or
b. The slower vehicle impedes further progress even before the turn-off point is reached.

"In the second instance the signal from the 'flying tail' would continue to increase in intensity; its indication to the driver may be either auditory or visual—in the form of a sound of rising amplitude or a flashing light of increasing frequency, warning him to decelerate or apply the brakes. As an alternative, the signal, from a certain level on, may reduce the fuel intake and, at a still higher level, actuate the power brakes. Again, by a three-way switch, the driver could be given the choice of unassisted manual control, manual control assisted by instruments indicating his position and the proximity of other vehicles, and of completely automatic guidance and collision prevention.

"Full automatization of the driving process can be envisaged as the final stage of the development. In addition to the installation of guidance and collision prevention equipment on the roads and in the vehicles, this would involve automatic inspection of the vehicle equipment and a continuous recording of traffic conditions at the gate stations. Indications of the position and velocities of the vehicles along the road section between successive stations would aid supervising personnel in the problem of traffic distribution. In addition, it would give immediate notification of breakdowns requiring emergency action.

"Freight transport along the highways presents one of the most challenging applications of full automatization. The establishment of a network of truck routes, separate from a highway system designed for passenger vehicles only, has been discussed repeatedly.

"With full automatization, it offers the possibility of driverless freight transport over long distances, with route terminals taking the form of marshalling yards. Here, small dispatching crews would send out the loaded trucks to their distant destinations and assign incoming vehicles to drivers for local delivery of the consignment. Assuming a cruising speed of 30 miles per hour, a separation between vehicles of 100 feet, and an average truck load of five tons, a one-lane route could handle nearly 200,000 tons a day. This large shipping capacity provided with minimum manpower requirements would do much to alleviate present bottlenecks in the delivery of consumers' goods and industrial raw materials."

A Used Tube May Be Better Than A New One!

(*Continued from page* 17)

(1) Premature removal of tubes as a result of preventive maintenance schedules which call for periodic removal of tubes from equipment and replacement with new ones.

Such preventive maintenance is based on the false idea that used tubes are necessarily poorer than new ones and therefore are more likely to fail. Unlike almost any other item you can name, a *used* electron tube may be better than a *new* one. Electron tubes are different from automobile tires or lamp bulbs, for example, which have well-defined lives.

Here's the reason. Tube mortality studies by communication companies and by tube manufacturers have repeatedly shown that when a large number of new tubes is put into operation, failures occur in signficant number during early hours of life. After an initial period lasting usually for some hundreds of hours, the law of survial is an exponential function of time. There is no available published evidence of any marked departure from this exponential law, such as would indicate a definite end-of life point!

One consequence of these facts is that the number of hours of use which a good used tube has had is of no value whatever in predicting how much longer it is likely to last. Another consequence is that once a tube has operated successfully during the initial period, its chances of surviving for a much longer time are usually good.

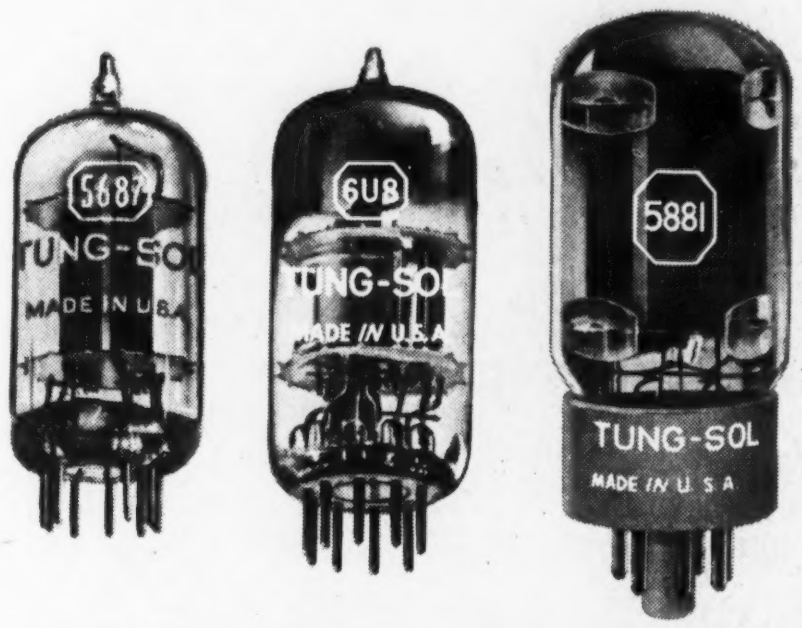
Recognizing this, the military services have lately begun to specify "reliable" tubes, even though they cost more. Tube manufacturers stabilize the characteristics of such tubes and cull out infant failures by operating them for 50 to 100 hours under conditions which simulate intended application; this is the "preburning" process.

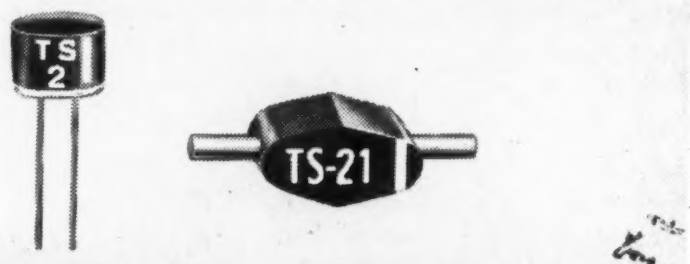
But this is exactly the process to which discarded good used tubes have been subjected. Moreover, they have been operated, not under *simulated* conditions, but under actual conditions. They have survived the critical hours of early life. Therefore they should not be discarded because they are used tubes; they should be kept in use, for in this respect they are equivalent to the "reliable" tubes.

(2) Failure to realize that some equipments in use—principally miniaturized—contain sockets which require selected tubes; these are tubes which must meet tighter limits for electrical characteristics than are required by JAN specifications, to insure proper functioning of the circuit in which they are used. In maintenance or trouble-shooting, a new electron tube will be tried as a replacement for failure tube, and, occasionally, it will be reported as "weak" or otherwise unsatisfactory. The new tube is then rejected or discarded. Invariably, the real source of the difficulty is not the tube. If it is not actually some form of circuit trouble, the situation is one which usually calls for a selected tube. All tubes which appear unsatisfactory in sockets which require selected tubes should therefore be tried out in other, less critical, sockets; they will invariably be found satisfactory.

Of course, it would be better if there were no equipments in Service use that contain sockets which require selected tubes. As a matter of fact, strenuous efforts are now being made to insure that no such equipment gets into future Service use. But, in the meantime, and probably for some time to come, such equipment will continue to be used. This fact must be taken into account in maintenance work.

(*Continued on page* 78, *col.* 1)





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A Used Tube May Be Better Than A New One!

(*Continued from page 77*)

(3) Wholesale removal of tubes when equipment trouble is encountered. This has been stated to occur with tubes which have been reported to be generally troublesome as a type or in particular equipments. True, such wholesale removal of tubes occasionally may be justified during emergencies, but it should not be followed as a general practice. *What's more, the good used tubes should not be discarded, but they should be put back into use!*

(4) Removal of tubes from sockets during trouble-shooting and replacement with new tubes as a quick means of determining if the replaced tubes were defective. This is poor practice because tubes and sockets can be damaged in this way; trouble-shooting preferably should be done without removing the tubes. One reason for this practice, again, is the wrong notion that new tubes are automatically better than good used tubes. Another reason is that regulations often require that neither the good used tube, nor the new tubes which were employed merely for trial, are to be accepted back into stock and credited. On occasion, conscientious technicians will put such tubes aside as spares, but often the lack of storage space and the requirements of "tidy housekeeping" will later result in the discarding of the tubes.

Since it has been pointed out several times that a used tube may be better than a new one, perhaps someone will come up with the idea of stamping a good used tube with an "S" (for superior) or a "P" (for premium), or even a gold star. It would appear that some such approach will be necessary to "sell" the fact that a used tube, unlike any other item of merchandise, may be better than a new one.

- - - — - —

Electronics in the Airpower Future

(*Continued from page 32*)

The Air Force is unique in having a centralized organization, the ARDC, which can devote its full energies to the task of assuring qualitative superiority. It is a difficult assignment—one which requires an appreciation of the problems not only of the Air Force, but also of industrial and university research organizations. ARDC has made a valiant start through its enlightened policies and it deserves our vote of confidence.

Electronics has much to offer to airpower future. With increasing speeds, airplanes become more and more dependent upon electronic flight instruments and controllers; bombs, rockets and guns are useless without radar and electronic computers; all-weather flying and even visual navigation requires electronics.

And finally, airpower in the sense of integrated striking and defensive power has no meaning without the "nervous system" provided by electronics. The future will see the use of smaller components, like transistors, and the introduction of new techniques, such as digital computers. Undoubtedly from a technical view, air-warfare will become a lot more complicated. This will be forced upon us by the capabilities of our enemy. Let us hope that through research and development, we as a nation can meet this challenge for overwhelming qualitative superiority, which President Eisenhower has so clearly stated as our national policy.

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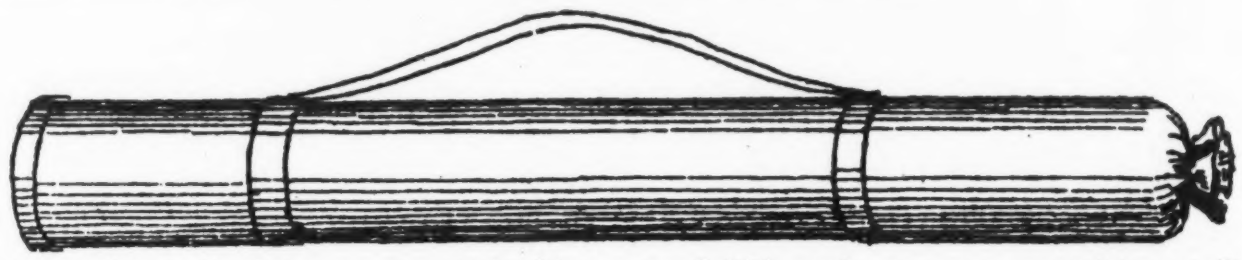
Join the hundreds of other communicators and "electronicians" who will gather in Washington from May 6th to 8th for the AFCA Convention. Exhibits, outstanding speakers, friends — you can't afford to miss this opportunity.

Civil War Signals

(*Continued from page 76*)

telegraph and especially in secret service as well as in visual signaling. Since Captain E. P. Alexander was soon made Chief of Ordnance, one Captain William Norris, later Major, became the Chief Signal Officer of the southern armies. One of his duties was to wait upon Jefferson Davis each morning with cipher dispatches from the generals of the armies and the commanders of the departments. The Confederates thought highly enough of their Signal Corps to establish it on an official basis less than a year after Bull Run. The Confederate Secretary of War by General Order on 29 May 1862 set up his Signal Corps and attached it to the Adjutant and Inspector General. He authorized one major, ten captains, ten first and ten second lieutenants and 20 sergeants. Privates were to be detailed as needed from other branches of the army. Thus the Confederate Signal Corps was established nearly a year earlier than its Federal counterpart. It was nearly as large, numbering some 1,500, most of the number however serving on detail. The Confederate Signal Corps used Myer's system of flags and torches. The men were trained in wire telegraph too and impressed wire facilities as needed. But



Myer's "Manual" pictures a complete kit, wrapped and ready to carry, containing staffs, torches and 7 flags: two flags six feet square, two, two feet square, and three, four feet square. The extra flag in the four foot size was black with a white square for use against snow or sky. Other items included were turpentine, scissors, matches.

there was nothing in Richmond or in the field comparable to the extensive and tightly controlled civilian military telegraph organization which Secretary of War Edwin M. Stanton ruled with an iron hand from Washington.

In the Northern army the Signal Corps carried on through the first two years of the Civil War as one man, Major Myer, supported by details of officers and men. The Corps was not authorized nor organized as an independent activity until the year after the Confederates had so recognized their signalmen. Myer had repeatedly petitioned the Secretary of War to put Federal signals on a permanent legal foundation. He particularly wished to end the evils of getting his officers and men on detail. He wanted his men to be recognized with permanent standing in their own right subject to the honors and promotions of other soldiers. Finally, on 3 March 1863, Congress established the Signal Corps, the Chief Signal Officer to be a colonel, assisted by one lieutenant colonel and two majors. For each army corps or military department Congress authorized one captain and not over eight lieutenants, who were to receive the pay and emoluments of cavalry officers of equal grade. Each officer was authorized to have one sergeant and six soldiers, who would receive the pay of similar grades of the Engineers. Hereupon the Signal Corps of the United States Army began its career. Myer, the first signal officer in any army, had laid good foundations. Among other things he had established a Signal Corps school on Red Hill in Georgetown in August 1861 where it flourished throughout the war. By the war's end the Corps numbered some 300 officers and over 2,000 men.

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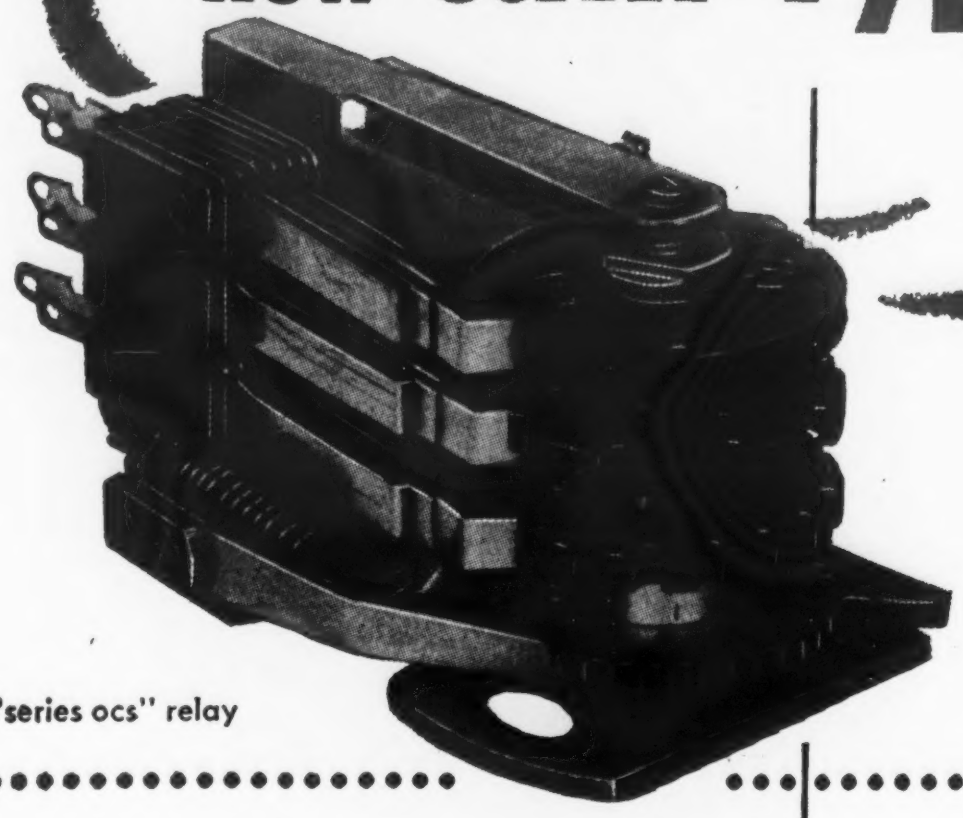
(*To be concluded in the May-June 1954 issue of* SIGNAL.)

new cam-type relay



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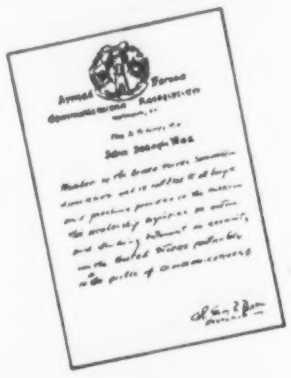

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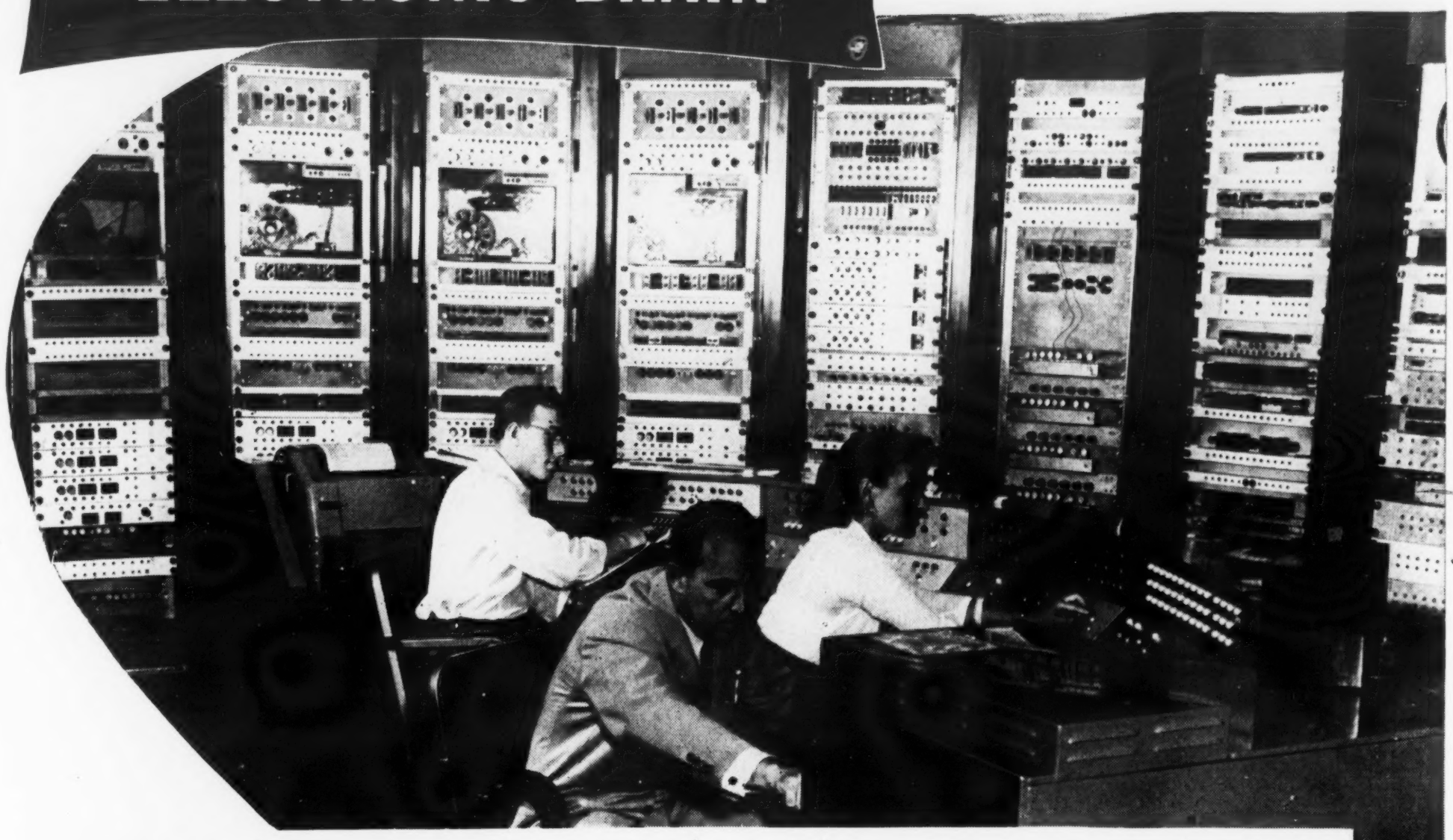

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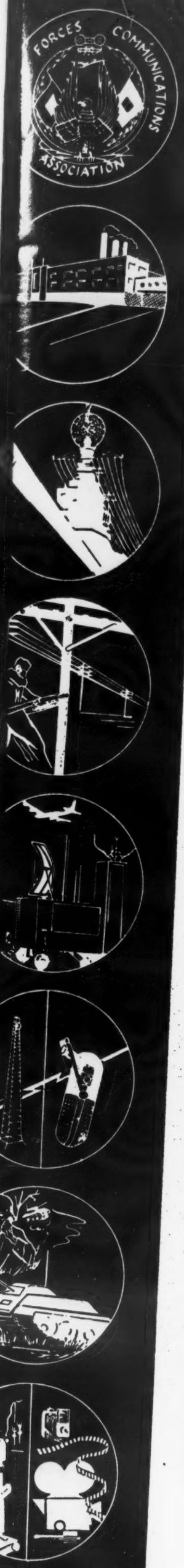
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